

**CLEANER, CHEAPER ENERGY: CLIMATE  
INVESTMENTS TO HELP FAMILIES  
AND BUSINESSES**

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**HEARING**  
BEFORE THE  
**SELECT COMMITTEE ON THE  
CLIMATE CRISIS**  
**HOUSE OF REPRESENTATIVES**  
**ONE HUNDRED SEVENTEENTH CONGRESS**  
FIRST SESSION

HEARING HELD  
DECEMBER 9, 2021

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**CLEANER, CHEAPER ENERGY:  
CLIMATE INVESTMENTS TO HELP  
FAMILIES AND BUSINESSES**

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**THURSDAY, DECEMBER 9, 2021**

HOUSE OF REPRESENTATIVES,  
SELECT COMMITTEE ON THE CLIMATE CRISIS,  
*Washington, DC.*

The committee met, pursuant to call, at 1:34 p.m., in Room 210, Cannon House Office Building, Hon. Kathy Castor [chairwoman of the committee] presiding.

Present: Representatives Castor, Bonamici, Brownley, Huffman, McEachin, Levin, Casten, Neguse, Escobar, Graves, Palmer, Carter, Miller, Crenshaw, and Gonzalez.

Ms. CASTOR. The committee will come to order.

Without objection, the chair is authorized to declare a recess of the committee at any time.

As a reminder, members participating in the hearing remotely should be visible on camera throughout the hearing, and as with in person meetings, members are responsible for controlling their own microphones. They can only be muted by staff due to inadvertent background noise.

And I would like to remind members that, per the guidance of the Attending Physician on July 27, members, staff, and all others physically present in an indoor U.S. House of Representatives space, including this hearing room, are required to wear masks unless seeking or under recognition by the chair.

In addition, statements, documents, or motions must be submitted to the electronic repository, to [SCCC.repository@mail.house.gov](mailto:SCCC.repository@mail.house.gov).

Finally, members or witnesses experiencing technical problems should inform committee staff immediately.

Good afternoon, everyone, and welcome to our hearing, Cleaner, Cheaper Energy: Climate Investments to Help Families and Businesses.

I will now recognize myself for 5 minutes for an opening statement.

Investing in clean energy will make America healthier and more resilient and unleash incredible economic benefits for American families, such as reducing the cost of energy, lowering electric bills, reducing costs of traveling, and creating millions of family sustaining jobs. By investing in clean electricity, energy efficiency, and electric appliances and vehicles, we will lower energy prices for families and businesses alike and cushion Americans from the vola-

tile prices of fossil fuels. The bipartisan infrastructure law made progress, and the Build Back Better Act will take us farther.

For decades, Americans have powered their homes, cars, and businesses almost exclusively through burning fossil fuels. But these fuels come at a cost to our health, to the pocketbooks of working Americans, including rising property insurance rates due to climate fueled storms, droughts, and wildfires. Whether it is price spikes at the gasoline pump or utility bills, rising energy costs can strain budgets of working families.

There are many factors behind the current costs of energy. The impacts of the ongoing COVID-19 pandemic, global oil market dynamics, repercussions of natural disasters, and increased U.S. natural gas exports all have a hand in driving up prices.

But we are taking action. The Build Back Better Act will put more money into the pockets of working Americans rather than excessive oil company and electric utility profits. Households could save about \$500 every year just on energy costs by embracing renewables, electric vehicles, home weatherization, and electric appliances.

The Build Back Better Act also will ensure that these savings reach all Americans, by making grants and loans available to rural communities and directing investments to environmental justice communities.

The Build Back Better Act also will help more Americans make the switch to money saving, and fun to drive, electric cars and trucks. Thanks to lower maintenance and fuel costs, families can save up to \$10,000 over the life of a vehicle by driving an electric car, compared to a gas powered one. These savings are double for rural drivers who often go longer distances and spend more on maintenance. And with the bipartisan infrastructure law, EV drivers will have more places to charge their electric cars and trucks, thanks to a historic investment to build up to 500,000 charging stations across America by 2030.

At home in Tampa on Monday, leaders of the Electrical Workers Union cheered the new investments because they have developed apprenticeship training for workers to build the charging stations and electric grid enhancements, and they are ready for new careers and higher wages.

The Build Back Better Act also will help cut air pollution and reduce the financial costs of fossil fuels that cost us up to \$870 billion a year in lost income and healthcare costs. It will improve the lives of the 70 million people of color who live in counties with failing pollution grades, exposing them to deadly threats like asthma and cancer. The Build Back Better Act invests in environmental justice for these Americans, directing at least 40 percent of investments to the communities most affected by pollution.

And as winter arrives, it is crucial to help more families save money through electrification. When it comes to heating homes, the EIA forecasts that families who use fossil fuels could see large increases on their heating bills: 54 percent for propane, 43 percent for home heating oil, and 30 percent for gas. In contrast, families who use electricity for heat are only expected to see a 6 percent jump. That is because the price of electricity, unlike the price of gas, remains comparatively stable, and it is just one more reason

why Congress must continue to make electrification easier and more accessible to American families.

Rising fuel prices are only further proof that we must accelerate the transition to clean energy as quickly as possible. We cannot remain stuck in the past. It is time to look to the future as we invest in the clean technologies that will help lead us into the 21st century and solve the climate crisis. So I look forward to today's discussion.

At this time, I will yield 5 minutes to the Ranking Member, Mr. Graves, for his opening statement.

[The statement of Ms. Castor follows:]

**Opening Statement of Chair Kathy Castor  
Hearing on “Cleaner, Cheaper Energy:  
Climate Investments to Help Families and Businesses”**

**Select Committee on the Climate Crisis  
December 9, 2021**

*As prepared for delivery*

Investing in clean energy will make America healthier and more resilient—and unleash incredible economic benefits for American families, such as reducing the costs of energy, lowering electric bills, reducing the cost of traveling, and creating millions of family-sustaining jobs. By investing in clean electricity, energy efficiency and electric appliances and vehicles, we will lower energy prices for families and businesses alike and cushion Americans from the volatile prices of fossil fuels. The Bipartisan Infrastructure Law made progress, and the Build Back Better Act will take us farther.

For decades, Americans have powered their homes, cars, and businesses almost exclusively through the burning of fossil fuels. But these fuels have come at a cost to our health and to the pocketbooks of working Americans, including rising property insurance rates due to climate fueled storms, droughts, and fires. Whether it's price spikes at the gasoline pump or on utility bills, rising energy costs can strain the budgets of working families. There are many factors behind the current costs of energy. The impacts of the ongoing Covid-19 pandemic, global oil market dynamics, repercussions of natural disasters, and increased U.S. natural gas exports all have a hand in driving up prices.

We are taking action. The Build Back Better Act will put more money in the pockets of working Americans rather than excessive oil company and electric utility profits. Households could save about \$500 dollars every year just on energy costs by embracing renewables, electric vehicles, home weatherization and electric appliances. The Build Back Better Act also will ensure these savings reach all Americans, by making grants and loans available to rural communities and directing investments to environmental justice communities.

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The Build Back Better Act also will help cut air pollution and reduce the financial costs of fossil fuels that cost us up to \$870 billion dollars a year in lost income and health care costs. It will improve the lives of the 70 million people of color who live in counties with failing pollution grades, exposing them to deadly threats like asthma and cancer. The Build Back Better Act invests in environmental justice for these Americans, directing at least 40% of investments to the communities most affected by pollution.

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fossil fuels could see large increases on their heating bills: 54% for propane, 43% for home heating oil, and 30% for gas. In contrast, families who use electricity for heat are only expected to see a 6% jump. That's because the price of electricity, unlike the price of gas, remains comparatively stable. And it's just one more reason why Congress must continue to make electrification easier and more accessible for American families.

Rising fuel prices are only further proof that we must accelerate the transition to clean energy as quickly as possible. We cannot remain stuck in the past. It's time to look to the future—as we invest in the clean technologies that will help us lead in the 21<sup>st</sup> century and solve the climate crisis.

I look forward to today's discussion.

Mr. GRAVES. Thank you, Chair Castor. And I want to thank our witnesses for being here today.

It has been interesting the past few months as we have seen gasoline prices skyrocket. We have seen the President of the United States send a letter to the Federal Trade Commission blaming it on energy companies. We saw Senator Warren send letters blaming it on natural gas exports. And in the same breath, effectively, we have seen folks like Jake Sullivan, the National Security Advisor for the White House, asking the OPEC nations, asking Russia and Saudi—OPEC plus nations, Russia, Saudi Arabia, Iran, and other countries to actually increase their oil production.

And, of course, that is similar to a message that we saw out of Senators Schumer, Markey, Cantwell, and Menendez a few years ago when they sent a letter to the then-President of the United States asking him to have other countries increase production of energy.

Folks are sitting here pointing at different reasons as to the high energy cost and complaining about the high energy cost, yet in legislation that just passed the House of Representatives weeks ago, there is a provision in there that imposes a \$10,000-a-mile-a-year fee on pipelines, which is the safest way to transport energy, a bill that—the same bill increases the regulatory burden. The same bill increases the royalty rate, or tax, that these companies are going to have to pay. And folks are around scratching their heads and pointing fingers as to why energy prices are going up?

It is pretty clear why energy prices are going up. The President of the United States has shut down the Keystone Pipeline, yet opened up the Nord Stream 2 pipeline for Russia to send Russian gas into Europe.

The President of the United States has put a pause on domestic energy production that a court had to step in and say you can't do this, there is a thing called the law. These are the reasons why energy prices are going up.

Everybody is out there pointing fingers. We have seen the Securities and Exchange Commission and other Federal Government agencies—they have no expertise in energy, none—out there telling companies that they are going to be pushing these ESG objectives and requirements that are going to be forcing these companies to effectively get off of conventional fuels.

We have seen comments out of our Department of Treasury and others saying that they don't want to make any investments in oil and gas. We have seen none. And we have even seen, out of the President's own budget, a provision for the Corps of Engineers that says we don't want to do anything, make any investments that will actually reduce the cost of consumption.



Finally, Madam Chair, there was a report out of the Senate Democrats—excuse me—the Senate Democrats’ committee that—Climate Committee that said that the policies that Democrats are pushing are going to increase cost of energy. They acknowledged it. They said it in the report.

Madam Chair, this is what we are seeing today. The United States actually achieved energy independence in November of last year. We achieved energy independence, to where, as Ms. Jaffe is going to be speaking about today, she talks about how—a theory that Russia and Saudi Arabia’s actions were the ones that are causing energy prices to go up or at least go up a few months ago.

Well, if we are energy independent, we are insulated from actions of other countries. Yet the very actions, the very initiatives of members of this committee and this administration, just as folks are saying we can’t depend upon Russia and China because they are going to—excuse me—Russia—because they are going to be exerting influence and causing prices to spike, all folks are doing now is trying to trade Russia for China and make us dependent upon them for our energy resources.

Madam Chair, these policies don’t make sense, they don’t add up, and all they are doing is increasing global emissions, increasing our dependence upon foreign energy sources like that from Vladimir Putin, who clearly doesn’t share America’s values. All it is doing is exporting jobs and increasing the cost of energy, that has a greater impact on those among us that can least afford it. It doesn’t make sense for any objective that we share. None. It is not in America’s interest.

Yet rather than recognizing errors were made, mistakes were made, and stepping back, we are watching people double and triple down on these flawed strategies that are increasing global emissions, increasing costs, sending jobs overseas, and subjecting us to greater leverage from countries like Russia. It is mind boggling to me.

Madam Chair, one of the key things that we have got to address, if we are going to be successful in moving into clean energy future, is that chart right there. That is the process, the regulatory maze, that people have to go through in order to try to actually execute.

I had a number of conversations with Mayor Mitch Landrieu, former Mayor of New Orleans, who is going to be the infrastructure czar. I told him the biggest challenge in front of him is trying to get through that. It is not just about building roads and bridges that currently take between 7 and 10 years in the regulatory process, Madam Chair. It is about trying to do clean energy projects and energy transmission. We have got to address this.

Madam Chair, I look forward to working together with you and committee members to advance our shared goals of reducing energy costs, of charting a clean energy future, and ensuring Americans have a place to go to work.

I yield back.

Ms. CASTOR. Without objection, members who wish to enter opening statements into the record may have 5 business days to do so.

Well, welcome to our panel of witnesses. These are industry leaders and energy policy experts who are going to share how the Build Back Better Act’s climate investments will help reduce electricity

bills and transportation costs, how we are going to address volatile fossil fuel prices, and help transition to a clean energy economy.

The Honorable Miranda Ballentine is the Chief Executive Officer of the Clean Energy Buyers Association. Ms. Ballentine leads a group of nearly 300 energy customers, seeking to procure clean energy across the United States, including service providers, businesses, and nonprofits.

Previously, Ms. Ballentine served as the Assistant Secretary of the Air Force for Installations, Environment, and Energy during the Obama administration, as well as the Director of Sustainability for Global Renewable Energy for Walmart.

Dr. Uday Varadarajan is the Principal in the Carbon Free Electricity Practice at RMI and a Precourt Energy Scholar at the Sustainable Finance Initiative at Stanford University, where his work focuses on how to use cutting-edge data and financial, policy, and regulatory analysis to help drive a just transition to clean energy.

Previously, Dr. Varadarajan served as a Program Examiner in the Office of Management and Budget, where he helped oversee the \$2 billion budget for the Department of Energy's Energy Efficiency and Renewable Energy Program.

Alex Herrgott is the President and CEO of The Permitting Institute, which advocates for changes to the infrastructure permitting process. Previously, he was the Executive Director of the Federal Permitting Improvement Steering Council, as well as the Associate Director for Infrastructure at the White House Council on Environmental Quality during the Trump administration.

And Amy Myers Jaffe is a Research Professor and Managing Director of the Climate Policy Lab at the Fletcher School at Tufts University. She was formerly the David M. Rubenstein Senior Fellow for Energy and Environment and Director of the Program on Energy Security and Climate Change at the Council on Foreign Relations.

Previously, Ms. Jaffe served as Executive Director for Energy and Sustainability at the University of California Davis, where she led research on low- and zero-carbon fuels and transportation policy.

Ms. Jaffe is the author of "Energy's Digital Future: Harnessing Innovation for American Resilience and National Security."

Without objection, the witnesses' written statements will be made part of the record.

With that, Ms. Ballentine, you are now recognized for 5 minutes for your testimony. Welcome.

**STATEMENTS OF THE HONORABLE MIRANDA A.A. BALLENTINE, CHIEF EXECUTIVE OFFICER, CLEAN ENERGY BUYERS ASSOCIATION, CLEAN ENERGY BUYERS INSTITUTE; DR. UDAY VARADARAJAN, PRINCIPAL, RMI, PRECOURT SCHOLAR, SUSTAINABLE FINANCE INITIATIVE AT STANFORD UNIVERSITY; MR. ALEXANDER HERRGOTT, PRESIDENT AND CEO, THE PERMITTING INSTITUTE; AND MS. AMY MYERS JAFFE, RESEARCH PROFESSOR AND MANAGING DIRECTOR, CLIMATE POLICY LAB, THE FLETCHER SCHOOL AT TUFTS UNIVERSITY**

**STATEMENT OF THE HONORABLE MIRANDA A.A. BALLENTINE**

Ms. BALLENTINE. Thank you.

Good afternoon. Chair Castor and Ranking Member Graves, and to all of the members of the Select Committee on the Climate Crisis, thank you for the opportunity to testify on the Build Back Better Act's clean energy provisions.

I want to start by thanking you all for your service to your constituents and to our nation as a whole and, for this committee in particular, to all of mankind, frankly.

My name is Miranda Ballentine. I am the Chief Executive Officer of the Clean Energy Buyers Association. I have spent two decades leading large clean energy buyers' strategies globally, including Walmart and the United States Air Force when I was the Assistant Secretary for Installations, Environment, and Energy. But, today, I am testifying on behalf of CEBA's 280 business members, over half of whom are large clean energy customers, and our membership really significantly contributes to America's prosperity. Our members have about 14 million employees and contribute about \$7 trillion in annual revenues.

And a few weeks ago, we set out a really bold aspiration, which is a 90 percent carbon-free U.S. electricity grid by 2030. And the Build Back Better Act is a key step on the path to this bold aspiration.

So my bottom line point today is that the clean energy investments in the Act are good for business, they are good for energy electricity prices for customers in particular, and they are good for the economy.

So I am going to make two key points in my opening remarks, and then I will look forward to taking your questions.

So, first, American businesses support the clean energy provisions in the Build Back Better Act. And the second key point that I will make today is that energy customers and energy markets matter and matter to decarbonizing the grid in a way that is good for our economy and good for all Americans.

So let's start with the first one. American businesses support the clean energy provisions in the Build Back Better Act. Last January, if you will recall last January, there were just a few things going on in our country. Despite that, three dozen iconic American brands asked the Federal Government to take action on clean energy policy. These were companies like Walmart, like the Walt Disney Company. These are companies like Johnson & Johnson, for whom there was a lot going on last January.

Fast-forward to today and we have 160 investors and companies of all sizes who have supported the BBBA and the Investment Jobs and Infrastructure Act.

Two dozen CEBA members have demonstrated their public support for the clean energy provisions in the Act, including companies like General Motors, Amazon, Google, PepsiCo.

Why are they doing this, you might ask. Well, these American businesses know that investments in clean energy can resuscitate our economy.

Let me give you just a few examples. Expanding organized wholesale markets to every region of our country can save energy customers \$11 billion on their energy bills—\$11 billion—by expanding wholesale markets. Thus, we really support the \$40 million dedicated—appropriated to DOE in the Act to provide states with assistance for their wholesale market electricity work.

Second, a national transmission grid could reduce energy prices by a further 2 percent. Every billion dollars that we invest in transmission creates \$2 to \$3 billion in direct customer benefit, and can create 7,000 jobs directly in construction on transmission, as well as 1,500 other related jobs. Likewise, clean energy investments create thousands of jobs in diverse geographies across the country.

So my second key point is that energy customers and energy markets matter. And with the right legislative and regulatory support, markets can accelerate a carbon-free energy system that benefits all Americans.

Sixty percent of Fortune 500 companies have public climate and clean energy goals. 1,100 companies are committed to science-based greenhouse gas reduction targets. 340 global businesses have committed to 100 percent renewable energy. And we have only scratched the surface of the demand.

Since 2008, corporate energy customers have driven 44 gigawatts of new wind and solar, and last year's 10.6 gigawatts was the equivalent of 40 percent of all new capacity—all new carbon-free capacity last year.

How are we doing?

All right. So I would conclude, bottom line is decarbonizing our power system is a key component of decarbonizing our economy. The U.S. must lead. We applaud the efforts of this Congress to take steps to do so, and we urge the Senate to also pass this bill without delay.

So, again, thank you for the opportunity to be here, and I look forward to your questions.

[The statement of Ms. Ballentine follows:]

**Statement by Miranda Ballentine  
Chief Executive Officer of the Clean Energy Buyers Association**

**Before the  
House Select Committee on the Climate Crisis  
December 9, 2021**

## **INTRODUCTION**

The Clean Energy Buyers Association (CEBA) thanks the Committee for the opportunity to share our perspective: the clean energy investments in the Build Back

Better Act (BBBA) are good for business, good for markets, good for consumer energy prices, and good for the economy.

CEBA<sup>i</sup> activates a community of 280 members—representing over \$7 trillion in annual revenues and over 14 million employees—to deploy market and policy solutions for a carbon-free energy system. Most of our members are institutional energy customers of every type and size—corporate and industrial companies, universities, and even cities.

Our vision is customer-driven clean energy for all.

CEBA is pro-market, pro-community, and pro-carbon-free energy. Energy customers have deployed over 44 gigawatts (GWs) of renewable energy since 2008, which is over a quarter of all wind and solar capacity in the United States, driving down air pollution and lowering energy costs for American businesses and families. Last year alone, voluntary energy customers contracted for 10.6 GW<sup>ii</sup> of clean energy—the equivalent of 40% of all new carbon-free capacity installed in 2020.

Energy customers face intractable barriers to procuring clean energy: lack of organized wholesale markets, need for expansion of transmission, lackluster investments in clean energy technology incentives, and underfunded research and development of emerging clean technologies. BBBA makes important investments in each of these areas that will result in powerful outcomes for our economy and community:

- **Expanding organized wholesale markets to every region of the country could save energy customers \$11 billion per year**, thus we support the BBBA's \$40 million appropriated to DOE to provide states with assistance to form, participate in, expand, or improve organized wholesale electricity markets.
- **A national transmission grid could reduce energy bills by 2%.** Likewise, every \$1 billion invested in large-scale transmission infrastructure creates \$2–3 billion in customer benefits, about 7,000 construction jobs, and about 1,490 new related jobs. Therefore, the BBBA's 30% transmission Investment Tax Credit, \$1.5Billion in grants for upgraded lines, \$100 million for planning and \$800 million in siting authorities grants is a first step in the right direction.
- **Clean energy could create thousands of new, geographically diverse jobs** across the supply chain. The BBBA's roughly \$200 billion in clean energy tax incentives will spur private sector investment across a range of clean energy technologies, including investments in renewables, advanced nuclear, carbon capture and sequestration, and clean hydrogen.
- BBBA also makes important investments to bring the **benefits of the clean energy economy to rural America**. These communities also should benefit from lower utility bills and have the opportunity to develop clean energy infrastructure.

We support the flexible, market-based, complementary suite of investments in BBBA that can empower energy customers to unleash an economic boom in clean energy and help us reach CEBA's aspiration of a 90% carbon-free electricity system in the United States by 2030.

This testimony lays out three key points.

- First, American businesses support the clean energy provisions in the BBBA because they are good for business, good for our communities, and good for our economy.
- Second, energy customers and energy markets matter and are key to driving affordable, clean energy for all Americans.
- Third, to solve the climate crisis, we must focus on decarbonizing our power system.

## 1. Businesses support federal action on climate and clean energy under the Build Back Better Act

Investments in clean energy can resuscitate the economy and society by creating vital tax revenue to support communities, growing the workforce by training and employing tradesmen and women, and can begin to address the disparate impacts of pollution and climate change on disadvantaged communities.

Businesses have leveraged their brand voices and influence to advocate for federal action on climate change since the start of 2021 while continuing to accelerate Environmental, Social, and Governance (ESG) efforts within existing operational and strategic priorities. Leading up to the 26<sup>th</sup> Conference of Parties (COP), over 778 businesses representing \$2.7 trillion in annual revenue and 733 investors managing more than half of the world's assets called on governments to raise climate ambition and implement meaningful climate policies.<sup>iii</sup>

In support of both the BBBA and the Investment Jobs and Infrastructure Act (IIJA), over 160 investors and companies of all sizes have urged U.S. lawmakers to support climate and energy investments to combat the climate crisis and put us on a path to achieving key decarbonization milestones.<sup>iv</sup> Members of the CEBA understand the importance of this critical moment and have demonstrated public support through the organization and individual advocacy efforts.<sup>v</sup> We have all of the tools and solutions to initiate meaningful solutions right now to help address extreme events ravaging communities, create new well-paying employment opportunities through ever-growing energy sector, and to improve U.S. economic competitiveness.

*The clean energy provisions in the Build Back Better Act are good for business.*

Achieving a net-zero U.S. economy by 2050 hinges on having sufficient time for the sectors where it is hardest and most costly.<sup>vi</sup> Ensuring the power sector decarbonizes as quickly as possible enables the clean electrification<sup>vii</sup> of other sectors.<sup>viii</sup> In the power sector, 11 independent recent studies,<sup>ix</sup> including by the Clean Energy Buyers Institute,<sup>x</sup> show that it is possible to cost-effectively achieve at least 80% clean electricity by 2030 with existing technologies, and with significant net benefits. The BBBA makes investments in the power sector that could get the U.S. up to 76%<sup>xi</sup> clean electricity when combined with broader federal actions, some of which are advanced by BBBA, and by state actions.

Tax credits are the cornerstone of clean energy deployment in the BBBA and modeling by Resources for the Futures (RFF) shows these investments alone could incentivize up to 69% carbon-free electricity by 2030.<sup>xii</sup> The roughly \$200 billion in clean energy tax incentives will spur private sector investment across a range of clean energy technologies, including investments in renewables, advanced nuclear, carbon capture and sequestration, and clean hydrogen. Capital expenditures will decrease power sector emissions, reduce technology deployment costs, put new steel in the ground, create thousands of new, geographically diverse jobs across the clean energy supply chain, and serve as a catalyst for future investments in emerging technologies.

These investments are essential to accelerating the pace of deployment, but alone, tax incentives won't ensure the scale and pace needed. To create the enabling conditions for faster and cheaper clean technology deployment that mobilizes innovation, private capital, and the demand of energy customers, we need to also leverage technology research and development (R&D), expand and improve organized wholesale markets, and accelerate transmission buildout to develop a national transmission grid.

The Clean Energy Buyers Institute partnered with RFF to analyze the most impactful policy pathways to power sector decarbonization. In addition to finding that a well-designed, bipartisan Clean Energy Standard (CES) is the most impactful way to reduce emissions in the power sector to greatest benefit, it also found that expanding wholesale markets and supporting significant transmission expansion are substantially helpful in reducing the cost, accelerating the pace, and enhancing the beneficial outcomes of the transition which include nearly \$100 billion in net annual benefits in 2035. The study's preliminary findings show that expanding organized wholesale markets to all regions of the country would save energy customers an additional estimated \$11 billion a year, and that the creation of a national transmission macrogrid by 2035 would reduce customer rates by roughly 2%.<sup>xiii</sup> The BBBA creates important investments that support both markets and transmission enablers of a lower-cost transition to clean energy.

Organized wholesale energy markets currently serve two-thirds of energy customers.<sup>xiv</sup> They are operated by various independent, non-profit entities, often referred to as regional transmission organizations (RTOs), that allow open, non-discriminatory access to the nation's transmission system.

In parts of the country with organized wholesale energy markets, clean energy is deployed at a higher rate and carbon emissions are dropping faster.<sup>xv</sup> For example, according to a November 2021 assessment, regions with competitive wholesale power markets reduced their power sector CO<sub>2</sub> emissions by about 35% from 2005 levels, while regions without wholesale power markets reduced their power-sector CO<sub>2</sub> emissions by about 27% over the same period.<sup>xvi</sup> Moreover, regions with wholesale power markets deployed almost 80% of all utility-scale wind and solar generation capacity, despite only accounting for about 67% of all existing power plant capacity, of all types.

RTO markets save energy customers money<sup>xviii</sup> by efficiently using existing resource fleets and reducing the need for additional resources. RTOs have reduced production costs by increasing trade, better coordinating power plants, and driving efficiency improvements at plants.<sup>xix</sup> One study estimates, nationwide, organized

wholesale markets saved approximately \$3 billion per year in production costs from 1999–2012.<sup>xx</sup> Organized wholesale markets, such as those operated by the Midcontinent Independent System Operator and PJM now save up to \$4 billion each annually.<sup>xxi</sup> Recent regional studies evaluating the cost benefits of expanding organized wholesale markets into the West and Southeast found substantial net benefits as well.<sup>xxii</sup>

Power grids are more resilient in parts of the country with organized regional electricity markets because regional grid operators have visibility across multiple utility territories. Risk of systemic disruptions are more effectively mitigated by pooling diverse resources and controllable demand across broader regions so that neighboring regions are better set up to assist each other.

American businesses and consumers demand a new paradigm—one that encourages both clean energy and economic competitiveness by leveraging markets. CEBA applauds the House for including language that would establish the “Organized Wholesale Electricity Markets Technical Assistance Grants” program, appropriating \$40 million to the U.S. Department of Energy to provide states, on a voluntary basis, with dedicated technical assistance and grants to evaluate forming, participating in, expanding, or improving organized wholesale electricity markets.<sup>xxiii</sup>

Well-planned transmission is crucial to least-cost decarbonization. As the grid decarbonizes, substantive and comprehensive action is required to ensure the nation’s transmission system can reliably and cost-effectively deliver carbon-free energy to all customers.

Due to ineffective, inadequate, and slow planning processes, as well as outdated siting procedures and cost-allocation methods, U.S. transmission expansion has not kept pace even with current demand despite major studies showing we need 2–3 times current transmission capacity by 2035 for decarbonization.<sup>xxiv</sup> Every \$1 billion invested in large-scale transmission infrastructure creates \$2-3 billion in customer benefits,<sup>xxv</sup> about 7,000 construction jobs, and 1,490 new related jobs.<sup>xxvi</sup> Inadequate transmission infrastructure results in procurement challenges for customers in regions of the country where transmission is constrained, with congestion increasing prices and limiting project interconnections.

Expanding transmission will enhance grid operations to meet energy customer demand by integrating clean energy resources, increasing grid resilience and reliability, and facilitating electrification initiatives. Transmission also enables markets to deploy generation over large areas, which optimizes renewable energy resources that are best managed and delivered across diverse geographic regions. For example, 15 states<sup>xxvii</sup> between the Rocky Mountains and the Mississippi River account for 88% of the nation’s potential wind capacity and 56% of potential solar capacity, but those states are only projected to account for 30%<sup>xxviii</sup> of the national electricity demand by 2050. Constructing new high-voltage, interregional transmission lines as part of a macrogrid will enable the movement of electricity from clean energy sources to major load centers.

Provisions in BBBA that specifically address the bottlenecks and inefficiencies in transmission planning, siting and construction, include:

- 1. Inter-regional planning. The \$100 million to plan, site, and build an inter-connected, national transmission “back-bone”, referred to as a “macrogrid,” will benefit customers by increasing grid reliability and efficiency, accelerating decarbonization goals, and creating cost savings.
- 2. Transmission Investment Tax Credit (ITC) and grants. Implementing a 30% transmission ITC can incentivize the construction of new lines where development otherwise would not occur due to challenges with cost allocation for inter-regional projects. An ITC can benefit customers by accelerating transmission projects that expand access to cheaper, zero-carbon energy and increase reliability. The \$1.5 billion in transmission grants in the bill would provide for new and upgraded lines as an important down payment toward dramatically expanding our transmission system and unlocking private sector capital.
- 3. Siting. Interstate siting is one of the biggest barriers to getting transmission projects built. The House allocated \$800 million to provide grants to transmission siting authorities to study and analyze the impacts of transmission projects, examining alternative transmission siting corridors, and for economic development activities for communities that may be affected by the construction and operation of a transmission project.

Additional programs make the BBBA a comprehensive approach to decarbonizing the electricity system. We need to make investments now to foster innovation and commercialize the technologies to get full decarbonization. The BBBA includes \$30 billion for clean technology funding, including \$1 billion for the Department of Energy (DOE) Research, Design, Development, and Demonstration (RDD&D) activities

and \$29 billion to support the rapid deployment of low- and zero-emission technologies.

Furthermore, BBBA makes important investments to bring the benefits of the clean energy economy to rural America. These communities also should benefit from lower utility bills and have the opportunity to develop clean energy infrastructure. Twelve percent<sup>xxix</sup> of U.S. electricity load is serviced by rural cooperative utilities and the BBBA uses a broad array of tools to support rural electric customers and spur rural clean energy economic development.

Finally, to bring increased clean energy onto the grid and reduce carbon emissions, we need to modernize the permitting process, including improving agency coordination to accelerate the environmental review process, while making certain that we do not compromise environmental protection and community participation. Combined, the BBBA advances the most comprehensive and substantial set of investments intended to unleash clean energy to date.

## 2. Energy Customers Matter

Energy customers have prioritized directly procuring clean energy as a key component of broader climate and energy goals since 2008. Leveraging their voice and demand for clean energy, organizations of all types have become agents of change by innovating to address market barriers hindering access to clean energy, creating new procurement structures, advancing emerging technologies, and advocating for policies that support the acceleration of clean energy.

Today, 60% of Fortune 500 companies have a public climate or clean energy goal.<sup>xxx</sup> Over 340 global businesses have committed to 100% renewable energy,<sup>xxxi</sup> and over 1,100 companies<sup>xxxii</sup> are committed to a science-based target aligned with 1.5 degrees Celsius. Financial markets are also increasingly interested in Environmental, Social and Governance (ESG) as financial regulators, investors, and asset owners turn their focus to more deliberate evaluation of the risks posed by climate change and prioritization of sustainable investing.

Clean energy has become a commonsense decision for many organizations. Because of clean energy's cost effectiveness, strong stakeholder demand, and greater interest in ESG impacts, Wood Mackenzie estimates that there is at least 85 GW of unmet demand in the U.S. from the largest existing energy customers to 2030.<sup>xxxiii</sup> As market demand for clean energy continues to swell, energy customers are battling intractable barriers that impact their ability to leverage markets to meet business goals and accelerate decarbonization of the U.S. energy system.

The biggest barrier to customer-driven clean energy is whether there is a market to transact in at all. Eighty percent of the 44 GW of new utility-scale wind and solar contracts driven by customers were in the organized wholesale markets that serve two-thirds of the nation's electricity customers. Where those markets don't exist, customers must negotiate time-consuming, and often less cost-competitive bilateral deals or utility tariffs in order to access clean energy.

In addition to customers being able to source clean energy, the grid needs to decarbonize for all customers, which is a function of the constellation of policies driving down clean energy costs and incentivizing faster deployment, including through foundational approaches like leveraging organized wholesale markets and transmission expansion, and technology R&D. The BBBA provides transformative investments across these priorities.

## 3. Decarbonizing the power sector is critical

To achieve a zero-carbon global economy by 2050,<sup>xxxiv</sup> the International Energy Agency calls for a 60% decline in emissions from the power sector globally by 2030.<sup>xxxv</sup>

The United States must lead. We are the largest historical emitter of greenhouse gases, the second largest GHG emitter globally, and the electricity sector in the United States is the second largest source of greenhouse gas emissions. Commercial and industrial customers account for over 60% of electricity consumption.

Clean energy is cost-effective. A recent study<sup>xxxvi</sup> found that the U.S. grid can achieve a 90% carbon-free generation mix by 2035 without increasing customer cost or undermining system reliability; what's missing is unified, predictable, durable, and ambitious deployment policy. The suite of approaches under Build Back Better Act (BBBA) would change that. As global investments in clean energy surpass a record-breaking \$500 billion,<sup>xxxvii</sup> the BBBA clean energy and climate provisions are an opportunity to usher in a historic wave of investment and innovation to accelerate emissions reductions swiftly through clean energy deployment.

Throughout history, our country has relied on energy infrastructure investments to lift us out of crises. President Roosevelt's New Deal saved the U.S. from economic collapse and brought electricity to rural America through investments in public



works projects. More recently, the American Recovery and Reinvestment Act rapidly put 2.3 million Americans to work, spurred innovations that dramatically reduced the costs of clean energy technologies, and leveraged private sector investments, raising the GDP by \$500 billion within one year.<sup>xxxviii</sup>

We applaud the efforts of this Congress to address climate change, accelerate clean energy and empower customers to lead the transition through the Build Back Better Act. We urge the Senate to preserve the House allocations to the clean energy provisions and pass the Build Back Better Act without delay.

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<sup>iii</sup> Lubber, M. and Schauble, B. 2021, November 19. *COP26 is over. Now it's up to investors, companies, and governments to raise their climate ambition*. Ceres. <https://www.ceres.org/news-center/blog/cop26-over-now-its-investors-companies-and-governments-raise-their-climate>

<sup>iv</sup> Ceres. 2021, October 27. *'There is no time to waste': Dozens of companies, investors urge Congress to act now on climate*. Ceres. <https://www.ceres.org/news-center/press-releases/there-no-time-waste-dozens-companies-investors-urge-congress-act-now>

<sup>v</sup> As of December 3, 2021, 24 CEBA member companies have released individual statements or signed letters of support of the clean energy provisions in the BBBA: Adobe, Amazon, Apple, Autodesk, Bank of America, Bp America Inc., Cummins, Ebay, Facebook/Meta, General Motors, Google, Hewlett Packard (HP), Johnson Controls, Mars Incorporated, Microsoft, Nestle, PepsiCo, Salesforce, Stonyfield Organic (Stonyfield Farm), Trane Technologies, VF Corporation, Volt Energy Utility, Walmart, Workday.

12 companies have publicly supported the CEBA statements on the Build Back Better Act and Infrastructure Investment and Jobs Act's clean energy and climate provisions, including: Amazon Web Services, Ebay, Electric Power Supply Association, Environmental Defense Fund, First Solar, Google, Iron Mountain, LevelTen Energy, Primergy Solar, Wells Fargo, WeWork, World Wildlife Fund.

<sup>vi</sup> The Net-Zero America Project which analyzes five different pathways to reach economy-wide net-zero emissions by 2050 finds, "Building a net-zero America will require immediate, large-scale mobilization of capital, policy and societal commitment, including at least \$2.5 trillion in additional capital investment into energy supply, industry, buildings, and vehicles over the next decade. Consumers will pay back this upfront investment over decades, making the transition affordable." Net Zero America. October 2021. *Net-Zero America: Potential Pathways, Infrastructure, and Impacts*. Princeton University. <https://netzeroamerica.princeton.edu/the-report>

<sup>vii</sup> A meta-analysis of 11 clean energy studies found agreement that decarbonization of the power sector amplifies electrification-based emission reductions across other sectors. Achieving 70-80 percent clean electricity by 2030 is necessary to reach the GHG reduction target of 50-52 percent below 2005 levels by 2030 and be on track to achieve zero-emissions by 2050: Esposito, Dan. September 2021. *Studies Agree 80 Percent Clean Electricity by 2030 Would Save Lives and Create Jobs at Minimal Cost*. Energy Innovation. <https://energyinnovation.org/publication/studies-agree-80-percent-clean-electricity-by-2030-would-save-lives-and-create-jobs-at-minimal-cost/>

<sup>viii</sup> A recent special report from the United Nations Intergovernmental Panel on Climate Change finds the world needs to cut its planet-warming emissions by about half by 2030 relative to a 2005 baseline: IPCC. 2018, Summary for Policymakers. *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. <https://www.ipcc.ch/sr15/chapter/spm/>

<sup>ix</sup> A meta-analysis of 11 cross-sector studies finds 80% clean energy by 2030 would add 500,000-1,000,000 net new jobs per year, prevent 85,000-317,000 premature deaths and save \$1-5 trillion in health costs through 2050: Energy Innovation. 7 September, 2021. *Studies Agree 80 Percent Clean Electricity by 2030 Would Save Lives and Create Jobs at Minimal Cost*. <https://energyinnovation.org/publication/studies-agree-80-percent-clean-electricity-by-2030-would-save-lives-and-create-jobs-at-minimal-cost/>

<sup>x</sup> Research between CEBI and RFF, Summary for Policymakers released in July 2021, finds that a clean energy standard achieving 80% clean energy by 2030 in-

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<https://cebusers.org/wp-content/uploads/2021/07/Evaluation-of-Power-Sector-Emissions-Reduction-Pathways-Summary-for-Policymakers.pdf>

<sup>xi</sup> Rhodium group found a combination of investment and regulations can achieve CO<sub>2</sub> emission reductions of 69-76% below 2005 levels in 2031: Larsen, J., King, B., Kolus, H., and Herndon, W. 23 March, 2021. *Pathways to Build Back Better: Investing in 100% Clean Energy*. Rhodium Group. <https://rhg.com/research/build-back-better-clean-electricity/>

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<sup>xiii</sup> Clean Energy Buyers Institute (formerly Renewable Energy Buyers Institute) and Resources for the Future. July 2021. *Evaluation of Power Sector Emissions Reduction Pathways*. <https://cebusers.org/wp-content/uploads/2021/07/Evaluation-of-Power-Sector-Emissions-Reduction-Pathways-Summary-for-Policymakers.pdf>

<sup>xiv</sup> Federal Energy Regulatory Commission. November 2015. *Regional Transmission Organizations*. <https://www.ferc.gov/sites/default/files/2020-05/elec-ovr-rto-map.pdf>

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<sup>xxi</sup> MISO. 2021. *MISO Value Proposition*. <https://www.misoenergy.org/about/miso-strategy-and-value-proposition/miso-value-proposition/>

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Ms. CASTOR. Thank you very much.

Next, we will go to Dr. Varadarajan. Dr. Varadarajan, you are recognized for 5 minutes for your testimony.

### STATEMENT OF DR. UDAY VARADARAJAN

Dr. VARADARAJAN. Thank you, Chairwoman Castor, Ranking Member Graves, and distinguished members of the select committee, for inviting me to testify and for your ongoing leadership in focusing on the climate crisis.

I am a Principal at RMI, which was founded in 1982, and is an independent, nonpartisan nonprofit dedicated to transforming global energy use to help create a clean, prosperous, and secure low-carbon future. And I am grateful for the chance to speak with you today about RMI's work to assess the potential impacts of climate investments in the Build Back Better Act on families and businesses across the country.

I wanted to start by noting that, indeed, this winter, more than half of American households could see energy bills rise by 30 percent or more because of skyrocketing natural gas and oil costs. Now, I think it is important to note this isn't an isolated incident,

and this has happened many, many times before. Just this February, in Texas, we saw a cold spell that led to daily gas supply suddenly falling by half, and led to huge blackouts, and about a \$47 billion spike in electricity costs over 1 week, as much as Texas usually pays over 3 to 6 years on generation.

These kinds of volatile and rising energy costs pose a real threat to the health and financial well-being of families across the country.

And to put a finer point on it, in 2019, the country's lowest income households, about 18 million, spent an average of about \$1 out of every \$6 on energy costs, a rate that is nearly 10 times that of households with above-average income. And, in fact, nearly half of all Americans pay more annually in energy bills than they do in Federal income taxes. So energy really matters.

In the near term, what can we do about this? Well, in the near term, things like science rapidly strengthening the energy assistance programs that we have in place, like LIHEAP, or through internationally coordinated releases of strategic oil reserves, as the Biden administration is pursuing, are important steps that can mitigate this harm. But that is not the long-term solution.

In the long run, the only way to ease the burden of volatile fossil fuel and energy costs on American families is to make the shift to better buildings and vehicles that use cleaner and cheaper energy sources with more stable energy prices. Such a shift could involve the use of wind and solar, complemented by battery storage, that offer energy price stability and can create durable energy savings for American households, all while reducing greenhouse gas emissions.

The Build Back Better Act could help American families and businesses do just this. They could really help the United States reduce greenhouse gas emissions from the supply of electricity and save Americans billions of dollars on their electricity bills and be less dependent on fossil fuels, whose changing prices disproportionately impact low-income households.

So how does it do this? First, one of the best ways to reduce both high energy burdens, and especially for low-income households, as well as the disproportionate negative health impacts they face by burning fossil fuels inside their homes, is through comprehensive upgrades to their homes and apartments, health and safety repairs, investments in efficiency and electrification.

The Build Back Better Act includes incentives for exactly these investments, particularly for low-income households, such as the high efficiency electric home rebates, two thirds of which must be directed to low-income and tribal households. Now a second way in which the Build Back Better Act helps to mitigate these burdens is through new and improved financial mechanisms such as the extension improvement on existing clean energy tax credits. These changes can allow customers of electric utilities across the country save money if their utilities and their regulators, in some cases, make the choice to switch to clean energy.

Now, we wanted to understand how this could actually work for households that were the most vulnerable to volatile fuel prices. So we analyzed the electricity costs paid by customers of those utilities that are most dependent on fossil fuels today. These are regulated

utilities, rural cooperatives, that serve 92 percent of the counties facing challenges with persistent poverty and publicly owned utilities.

Together, these utilities own about 80 percent of the remaining coal power in the U.S., and we asked how the Build Back Better Act could impact them. And what we found is that the incentives in the Build Back Better Act, if they became law, along with existing policies, could allow customers of these utilities to see annual savings of up to \$11 billion a year by 2030, if these utilities choose to use the incentives that are being offered to them and to reduce their use of fossil fuels and build in clean generation and, at the same time, reduce their greenhouse gas emissions by 67 percent.

And, moreover, we found that these savings are concentrated in households and regions with the highest energy burden.

So, in short, increasingly expensive fossil fuel burdens fall on customers with high costs. But the Build Back Better Act makes shifting to clean energy easier, reducing costs to customers while providing help to the regions that most need it.

Thank you.

[The statement of Dr. Varadarajan follows:]

**Testimony of Dr. Uday Varadarajan**

*Principal, RMI and Precourt Energy Scholar, Sustainable Finance Initiative at Stanford University*

**Before the Select Committee on the Climate Crisis**

**“Cleaner, Cheaper Energy: Climate Investments to Help Families and Businesses”**

**2021-12-09**

**Introduction**

This winter, more than half of American households will see their energy bills rise by 30% or more<sup>1</sup> due to skyrocketing natural gas and oil costs. Rising energy costs pose a real threat to the health and financial well-being of families, especially the 4.8 million low-income households in the United States that missed an energy bill payment in 2020.

Rapidly strengthening energy assistance programs such as the Low Income Home Energy Assistance Program<sup>ii</sup> that aid households with a high energy burden (share of household income that goes to energy expenditures) is an important step to mitigate this threat and protect low-income families from energy shutoffs—at least in the near term.

However, the long-term solution to easing the burden of volatile energy costs on American families is to shift to cleaner, cheaper energy sources. Cleaner energy sources such as wind and solar complemented by battery storage offer energy price stability and could create durable energy savings for American households. The Build Back Better Act as passed by the House expands and improves financial incentives such as clean energy tax credits<sup>iii</sup> to accelerate the transition to clean energy resources, reducing energy bills and negative health impacts for families across the country.

**Build Back Better**

The Build Back Better Act will help the United States reduce its greenhouse gas emissions from the supply of electricity, save Americans billions of dollars on their electricity bills, and be less dependent on volatile fossil fuels whose changing prices disproportionately affect low-income households. The most significant drivers of the overall cost and emissions reductions are three changes to the tax code. First, the Act extends and expands clean energy tax credits, allowing any carbon-free generation resource installed over the next ten years to benefit from a \$25/megawatt-hour production tax credit. Next, the Act provides incentives to improve the reliability and resilience of the electric grid by introducing a 30% investment tax credit for battery storage and transmission. Finally, the Act allows both tax credits to be avail-

able via direct pay,<sup>iv</sup> which enables electric utilities of all kinds to fully utilize the tax credits without delay to maximize cost reductions for their customers. As a result, utilities can use the Build Back Better tax credits to reduce the carbon they emit by deploying a diverse set of clean energy technologies, while providing low-cost and reliable electricity service.

In addition, the Act features several provisions aimed at ensuring that energy cost relief and clean energy investment benefits low-income and fossil-dependent communities. For example, the Act provides funding for the USDA to help rural electric cooperatives reduce the debt burden and facilitate their reinvestment in clean energy—thereby helping bring down energy bills for the 92% of the U.S. counties with persistent poverty that are served by cooperatives. On the investment side, clean energy projects built in low-income or fossil-dependent communities are eligible for tax credit enhancements funded by the Act, ensuring that these communities are able to share in the wealth created by the transition to clean energy.

### **Build Back Better Reduces Emissions and Lowers Energy Bills**

To assess the potential magnitude of the emissions reductions and savings made possible by the Act, RMI analyzed the impact of existing clean energy incentives as augmented Build Back Better provisions on the economics of the regulated, cooperative, and publicly owned utilities that own and operate nearly 80% of the remaining coal plants. Using publicly reported utility data sourced from RMI's Utility Transition Hub<sup>v</sup> and federal agencies, RMI calculated the effective "crossover" points at which adding more generation from renewable energy can save utility customers money relative to current utility operations. We also accounted for increasing costs of capacity from battery storage to enhance system reliability as renewable energy usage increases. Finally, RMI incorporated Build Back Better Act policies like expanded clean energy tax credits, low-cost refinancing, and debt relief for electric cooperatives. We assumed that with these policies, clean energy replaces fossil generation once it becomes cost-effective to do so, with savings calculated from the difference in energy costs between renewables and fossil generation. RMI calculated emission reductions by measuring the Build Back Better Act against a baseline that begins with the reported emissions from power plants in 2019.

The numbers are clear—clean energy and the Build Back Better Act will save billions of dollars over the next decade and significantly reduce greenhouse gas emissions by enabling utilities to accelerate their transition to cleaner, cheaper resources:

- Utility customers will see **annual savings of \$11 billion per year annually by 2030** from the transition to clean energy,<sup>vi</sup> and
- The combined impact of the Act with existing policies and the declining costs of clean energy can make it economic for these **utilities to reduce their GHG emissions by 67%—or 658 Million Metric Tons of CO<sub>2</sub> annually—relative to their 2019 emissions by 2030**, lowering emissions by as much as **4.2 Billion Metric Tons of CO<sub>2</sub> cumulatively from 2022–2030**.<sup>vii</sup>

And with a grid powered by clean electricity, the electrification and decarbonization of other sectors will follow. In short, the savings and emissions reductions presented in this analysis refute the myth—one that has garnered a great deal of airtime during the federal budget debate—that transforming our electricity sector will be too expensive for customers.

10 Largest Utilities by 2019 Emissions	Total Annual Emissions in 2019 (MMT)	Emissions Reductions Percentage	Levelized Annual Savings by 2030 (2019 dollars)
PacifiCorp	40.38	34%	\$55,828,365
Florida Power & Light Company	39.78	59%	\$170,195,776
Alabama Power Company	29.41	25%	\$190,866,271
Tennessee Valley Authority	28.73	69%	\$271,330,338
DTE Electric Company	26.98	44%	\$61,847,149
Georgia Power Company	25.61	60%	\$272,834,323
Duke Energy Carolinas, LLC	25.32	78%	\$150,800,122
Ameren Missouri	24.42	18%	\$76,255,793
Virginia Electric And Power Company	22.02	37%	\$537,524,393
Appalachian Power Company	18.77	91%	\$248,762,467

Levelized annual savings and emissions reductions by 2030 with Build Back Better compared to 2019 for the 10 largest utilities by CO<sub>2</sub> emissions. Source: [RMI Utility Transition Hub](#), FERC, EIA, NREL

### **Build Back Better Empowers Households to Act to Reduce Their Energy Burden**

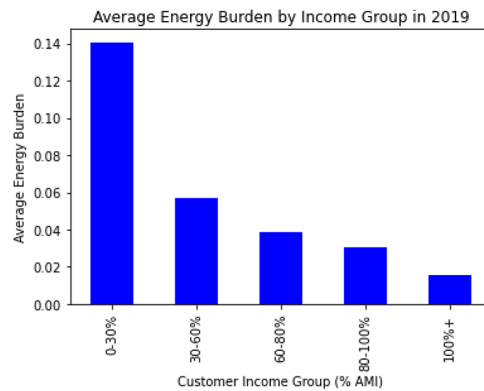
One of the best ways to reduce both the higher energy burdens borne by low-income households and the disproportionate negative health impacts caused by burning fossil fuels inside homes<sup>viii</sup> is through funding comprehensive building upgrades—health and safety repairs, efficiency, and electrification at the same time. The Build Back Better Act includes incentives for such investments, particularly for low-income households, such as the High Efficiency Electric Home Rebates, two-thirds of which must be directed to low-income and tribal communities, and the Home Energy Performance-Based Whole-House Rebates and Training Grants. The full benefits of all of these programs must be made accessible to those most burdened by high energy and housing costs and suffering the impacts of substandard homes. As examples, the same changes to allow refundability and direct pay proposed for the renewable energy tax credits under section 25D should be extended to the residential efficiency tax credits under section 25C, and the new construction tax credits under section 45L should not reduce the basis for the Low-Income Housing Tax Credits when used together for highly efficient affordable housing projects. These provisions would improve both air quality and human health while improving living standards and saving households money.

### **Build Back Better Protects Vulnerable Families**

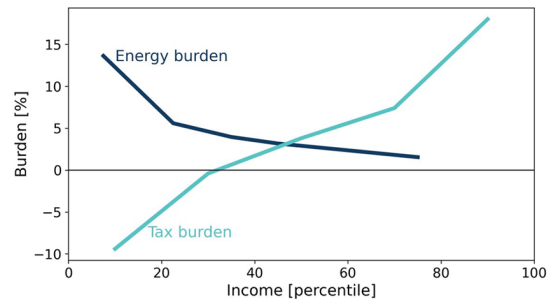
Replacing expensive fossil generation will not only reduce emissions and helps meet ambitious US climate commitments, but it will also save Americans money on their electricity bills. Such savings are important for all Americans facing rising fuel costs but are especially crucial for households that experience high energy burden.



In 2019, the country's 18.2 million lowest-income households spent an average of one out of every six dollars on energy costs,<sup>ix</sup> a rate nearly ten times that of households with above-average income. In fact, nearly half of all Americans pay more annually in energy bills than they do in federal income taxes.<sup>x</sup> This issue is all too relevant today, as we've just seen the average energy burden from electricity expenditures has increased<sup>xi</sup> for the first time since 2014. Reducing this energy burden will provide these families substantial relief.



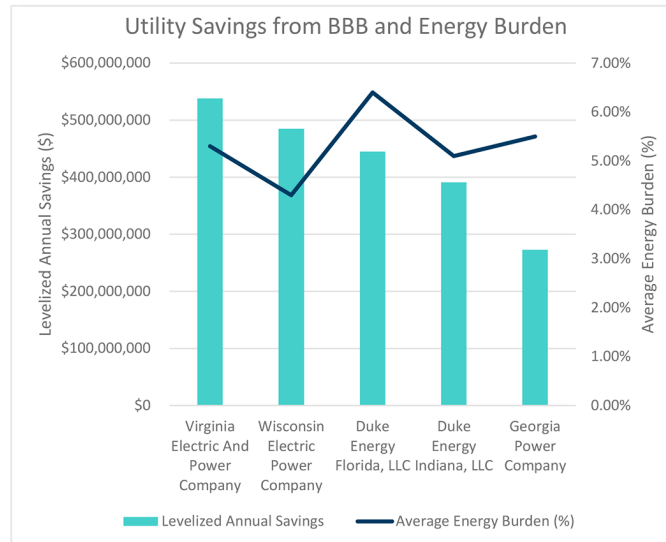
Average energy burden by customer income group in 2019. Source: [RMI Utility Transition Hub](#)



Energy burden vs. tax burden. (Tax burden here means the federal tax rate, excluding payroll taxes, divided by income.)

Sources: [RMI Utility Transition Hub](#), Tax and Policy Center.

In fact, the Act's savings are concentrated in households in regions with the highest burden. According to RMI's analysis, the five utilities with the highest potential annual savings from Build Back Better serve households with an average energy burden in the top quartile across all utilities.



Levelized Annual Cost Savings and Energy Burden for Utilities with the greatest potential annual savings from the shift to clean energy enabled by the Build Back Better Act. Source: [RMI Utility Transition Hub](https://rmi.org/utility-transition-hub/) and internal modeling

In short, increasingly expensive fossil fuels burden customers with high costs that can rise with little warning. The Build Back Better Act makes shifting to clean energy easier, reducing costs to consumers while providing help to the regions that are most in need.

### References Page

- <sup>i</sup> <https://www.eia.gov/outlooks/steo/report/WinterFuels.php>
- <sup>ii</sup> <https://www.acf.hhs.gov/ocs/low-income-home-energy-assistance-program-liheap>
- <sup>iii</sup> <https://www.utilitydive.com/news/550b-clean-energy-climate-spending-build-back-better-credit-renewable-congress/609151/>
- <sup>iv</sup> <https://rmi.org/simple-tax-changes-can-unleash-clean-energy-deployment/>
- <sup>v</sup> <https://utilitytransitionhub.rmi.org/>
- <sup>vi</sup> Levelized annual savings by 2030 for FERC-reporting utilities and extrapolated across the entire electricity sector with Build Back Better Act compared to 2019. Sources: RMI Utility Transition Hub, FERC, EIA, NREL
- <sup>vii</sup> Annual emissions reduced for FERC-reporting utilities with Build Back Better Act compared to 2019. Sources: RMI Utility Transition Hub, FERC, EIA, NREL
- <sup>viii</sup> <https://rmi.org/uncovering-the-deadly-toll-of-air-pollution-from-buildings/>
- <sup>ix</sup> <https://www.canarymedia.com/articles/energy-equity/build-back-better-act-would-reduce-burden-of-household-energy-costs>
- <sup>x</sup> <https://www.canarymedia.com/articles/energy-equity/build-back-better-act-would-reduce-burden-of-household-energy-costs>
- <sup>xi</sup> <https://utilitytransitionhub.rmi.org/portal/>

Ms. CASTOR. Thank you very much.

Mr. Herrgott, you are recognized for 5 minutes to present your testimony. Welcome.

### STATEMENT OF ALEXANDER HERRGOTT

Mr. HERRGOTT. Chair Castor and Ranking Member Graves, my name is Alex Herrgott, and I serve as the President of The Permitting Institute, or TPI. We are a nonpartisan, nonprofit organization focused on simplifying the permitting process so that we can both

protect our nation's resources and build the critical infrastructure America needs.

While we are based here in Washington, DC, TPI's most important work happens in the field and across the country where most critical project approvals occur. Our team of scientists, engineers, and attorneys recruited from Federal agencies, including recent additions of senior permitting officials from the Biden administration, have a long track record of success in balancing infrastructure needs with creative solutions to deliver improved environmental and community outcomes during the permitting process.

We are the real-world, project-delivery practitioners behind the scenes in both the private and public sector who have written 2,000-page environmental impact statements and the additional 2,000 pages of appendices and technical reports. We have been in the trenches, written the laws, and worked alongside agency staff to untangle the web of permitting confusion caused by overlapping and conflicting requirements across dozens of Federal and state agencies, a hundred permitting laws, and the resulting maze of regulations, executive orders, and judicial precedent that govern infrastructure development.

Our mission is to strengthen the partnership between government and impacted communities and industry. We deploy a collaborative, practical, problem solving approach that has successfully guided many of the largest wind, solar, transmission, and coastal restoration projects in the U.S., saving years and billions in costs.

TPI members, and members of your committee, know all too well that funding is only the first step in delivering the improvements promised in the Infrastructure Investment and Jobs Act. But to be clear, to build back better, we first must be able to build, and currently that is not the case.

TPI strongly supports recent permitting reforms, along with new training and siting and assistance grants to states, cities, and Tribes, but these will yield only modest benefits for those who are invested in a cleaner, cheaper energy future, a status quo that diminishes or, at best, delays the impact of any new funding currently being discussed in Congress.

Developers across all sectors, while still experiencing the same chronic obstacles and process delays, they see consistency in policy, predictability in process, and some basic accountability for appropriate reviews; not guaranteed outcomes or yeses, just a decision in a reasonable amount of time. Unfortunately, this is a human-based system spread across sometimes 50 different decision makers and chains of command, each with their own requirements that are rarely aligned.

To achieve real progress, Congress must tackle the underlying sources of bureaucratic gridlock. Permitting reform has been the central focus of Republican and Democrat administrations, yet compromise remains elusive.

Americans are already experiencing the cost of inaction. Rising energy costs and volatility in our energy markets continues as we transition from those conventional to renewable resources, as the other witnesses have mentioned. With much of the much-needed infrastructure still in the earliest planning stages, they still now face a maze of permitting obstacles that developers report are

responsible for adding an additional 20 to 30 percent on total project costs.

These costs are ultimately passed on to the public in the form of higher taxes and escalating utility rates. In this system, no one wins: not the environment, not the stressed U.S. electricity grid, and definitely not the ratepayers.

Project developers, including many of our members, stand ready to pursue \$600 billion to \$800 billion in private investment for new wind, solar, transmission, hydrogen, storage, and carbon capture. The reality, however, is the benefits of projects initiated today won't be realized for 7 to 10 years because of the current permitting system.

It could be hydropower plants that are routinely challenged in court, citing conflicting statutory and regulatory requirements, a growing list of proposed offshore wind projects and other onshore on Federal lands stalled by the constantly evolving rules governing species and wetlands protections.

One egregious example is a \$3 billion investment in a clean energy transmission line that began the permitting process more than a decade ago. The project was finally approved 4 years ago. However, it is now entangled in court proceedings because one hand did not know what the other hand was doing within the same Federal agency.

This is not a Republican or Democrat issue. This is a process issue. The lack of a predictable permitting process is the enemy of progress, and that uncertainty is keeping hundreds of billions of dollars of new investments on the sidelines.

Beyond those existing permitting obstacles, new infrastructure investment must now also contend with the regulatory whiplash with contradictory regulations being proposed and issued every couple years. Projects currently undergoing review, years into the process, are left in a no man's land trying to figure out what to do, while agencies provide no guidance regarding decision making in the meantime.

TPI is working to bridge the disconnect between erratic policy shifts and the real-world consequences on the ground. We are building a large coalition of diverse entities, committed to achieving a balance between progress and protection. The key is greater coordination efficiency, not limits on stakeholder participation or shortcuts to laws and regulations. More comprehensive and lasting permitting reform efforts in the past have been blocked by the notion that faster always means fewer protections to the environment. That is simply false.

Congress should embrace reforms that expand state, local, and Tribal partnerships, such as TPI State Permitting Council initiative that builds trust, communication, and coordination between state and Federal regulators. We also recommend this committee take a hard look at achievable compromise on legislative reform initiatives such as the BUILDER Act, which clarifies the appropriate role for Federal reviews at state levels.

And to conclude, if we agree that a project development cycle of 7 to 10 years, regardless of the energy source, is simply too long, we must move past fringe talking points and political posturing and take the next steps together. We have no other choice. By

doing so, we will unlock the opportunity to modernize and expand our energy infrastructure, while expanding the supply of U.S.-sourced critical minerals essential to make these projects a reality. These efforts will safeguard communities, protect the environment, while simultaneously securing new domestic sources of affordable energy and the jobs bringing American industry back to life.

Thank you very much.

[The statement of Mr. Herrgott follows:]

**Written Testimony of Alexander Herrgott  
President and CEO, The Permitting Institute**

**U.S. House of Representatives Select Committee on The Climate Crisis  
*Cleaner, Cheaper Energy: Climate Investments to Help Families and Businesses***

**Thursday, December 9, 2021**

**1:30 p.m.**

**210 Cannon House Office Building**

Chairman Castor and Ranking Member Graves, my name is Alex Herrgott and I am president of ThePermitting Institute (“TPI”). TPI is a Washington DC-based non-profit, non-partisan organization, whose purpose is to modernize America’s aging infrastructure while protecting our environmental, cultural, and historic resources.

I appreciate the opportunity to discuss targeted actions Congress can take to increase the efficiency and certainty of the permitting process, while enabling construction of affordable, reliable, and resilient energy infrastructure. Permitting confusion, redundancy, and uncertainty increase the cost of energy and our dependence on foreign nations—including our adversaries—thereby diminishing America’s global competitiveness.

The unfortunate reality is that the permitting reforms in the new bipartisan infrastructure law will yield only modest benefits for the transportation, coastal restoration, broadband, energy, and water infrastructure and resources project developers.

Those developers will experience 99% of the same chronic obstacles and process delays. To achieve real progress, Congress must address the bureaucratic gridlock blocking new investment.

Permitting uncertainty is diminishing and delaying investment returns across all infrastructure sectors, most notably the expansion of conventional and renewable energy and transmission development.

Volatility in energy markets continues to increase as the country transitions its energy supply. The mismatch between planned electric generation—often delayed by a 7 to10 year development timeline—and electric generation retirement are causing supply and demand issues that are, in part, responsible for rapid increases in domestic and global energy prices.

An equally big deal is the \$600–\$800 billion in private investment for new wind, solar, transmission, hydrogen, storage, and carbon capture waiting on the sidelines for clarity and certainty. These “big deal” numbers are further informed by an April 2021 report by Grid Strategies LLC, released during a Department of Energy event, that shows 22 “shovel-ready” transmission lines stalled in various phases of the permitting process, with no resolution in sight.

TPI urges this Committee to focus future comprehensive permitting reform efforts broadly and dispassionately on all sources of bureaucratic obstructions blocking accelerated deployment of new clean energy projects. The alternative is a status quo that benefits no one.

Accordingly, project developers and TPI members are hesitant to invest. They know that projects initiated today will not be able to commence operations and realize their investment cost recovery for 7 to10 years at the earliest. As this summary timeline articulates, our nation’s permitting system does not solve problems, it creates them.

To illustrate the problem, for major infrastructure projects, it takes:

- **2-to-3 years** of project design, engineering, permitting, planning, and financing
- **2-to-4 years** of formal permitting process submission and review—a timeline that pushes orders for equipment, steel, concrete, and labor contracts years into the future
- **2-to-3 years** of construction—this assumes permitting approvals are granted and supply chain orders are aligned

Despite these challenges, I am here today to highlight significant opportunities for progress and to help remove obstacles impeding infrastructure project timelines. TPI provides guidance early in the process and throughout a project's development—helping our members identify issues years ahead of the current timeline. We minimize risk of delays and avoidable costs by working with all parties to identify a streamlined path to completion while protecting our natural resources.

Still, TPI members, and members of this committee, know all too well that energy projects are routinely stymied at various phases of project development by disconnected and fragmented federal and state review processes. Permitting is often marred by contradictory and redundant rules, timelines, and policies that cause delays, cost overruns, and in some cases, project abandonment.

Chronic permitting problems are exacerbated by the lack of bureaucratic accountability. Our broken system allows agencies to sit on applications for years, even decades in some cases, with no certainty of eventual project approval. TPI does not maintain that federal agencies owe project developers a yes, but we believe federal agencies owe project developers an answer—yes or no—in a reasonable timeframe.

While the focus in most permitting timeline discussions often centers on the National Environmental Policy Act (“NEPA”), NEPA is just one process among more than 60 possible federal permits that may be required for a project, spread across 13 federal agencies, not including myriad state and local permitting obligations.

Many otherwise “shovel-ready” infrastructure projects spend years in bureaucratic gridlock. Developers routinely find themselves struggling through the informal pre-permitting, planning, and application process—again, often for years—with extensive ongoing submission and review cycles before NEPA reviews formally commence. Consider these examples:

- Proposed energy projects on federal lands continue to face constantly evolving rules governing species and wetlands protections.
- Some federal agencies have identified new formal or informal policies over the past several years to frontload biological, cultural, and historical survey requirements prior to formally starting the review process—pushing the official starting point even further into the future. In some cases, project pre-planning increases efficiency and substantial discussion early in the process, but in others it can conceal the full duration of the permitting review process and leave developers with no final federal to challenge.
- One egregious example is a \$3 billion investment in a clean energy transmission line that began the permitting process more than a decade ago. The project endured seven years of review and was finally deemed “complete” by the federal government four years ago. However, it is now entangled in court proceedings because one hand did not know what the other was doing—within the same federal agency.
- Multiple offshore wind projects, including Skipjack, Mayflower, and Bay State, even after becoming a clear priority for the Biden Administration, have yet to receive a preliminary permitting timetable from federal agencies, even for those projects statutorily required to have a permitting timetable.
- Over the last few years, several exploration, copper, lithium, molybdenum, nickel, and other mineral projects essential for battery storage and EV deployment have been stalled by internecine squabbling among federal agencies and litigation. This includes a proposed road in Alaska that would have moved critical and “renewable energy” minerals from remote parts of the state to industrial centers.
- Several hydropower permits and operating authorizations have also been challenged in court, citing conflicting statutory and regulatory requirements among as many as 10 federal agencies.

Each of these examples—and there are hundreds more—points to the urgent need to repair the outdated and chaotic permitting system that keeps the country from meeting our growing infrastructure needs.

Most major U.S. infrastructure investments in energy, including wind, solar, hydrogen, carbon capture, hydro, and geothermal, as well as broadband, electricity transmission, oil and gas pipelines, supply chain port expansion, and export devel-

opment are entirely supported by U.S. companies and investors in the private sector. Energy and infrastructure investors require predictability and prompt decision making when putting capital at risk. Unfortunately, investors are too often treated as adversaries pitted against federal regulators rather than as partners in rebuilding our nation.

Despite bipartisan agreement that the country's permitting process is broken, outside stakeholders, each prioritizing their narrow interests, are inhibiting additional reforms. But there is a path forward.

Lawmakers should build on and expand the reforms enacted over the past decade. Perhaps the most notable accomplishment was the creation of the Federal Permitting Improvement Steering Council (FPISC), a voluntary program for project developers charged with identifying best practices and implementing basic project management practices across 13 federal agencies. The extension of this Council is appreciated by TPI members. However, the FPISC dashboard currently hosts only 20 active multiyear projects of the largest and most complicated efforts in the country—a number that must grow substantially. FPISC's leadership, particularly Executive Director Christine Harada, is preparing the Council to grow. The Council has accepted 8 new projects in 2021, six wind farms, one solar project, one transmission line.

Additionally, thanks for the new bipartisan infrastructure bill, the "One Federal Decision" (OFD) framework enhances coordination among agencies with the goal of completing NEPA review in an average of two years for major surface transportation projects. Unfortunately, if a project doesn't meet the limited and precise FPISC or OFD criteria, coordinating support is limited. This reality leaves hundreds of developers proposing \$600–\$800 billion in new energy infrastructure suffering through the status quo. Currently, there are no new enacted reforms supporting these important projects.

TPI commends Congress for passing, and President Biden signing, bipartisan infrastructure legislation. However, the Administration is rescinding longstanding permitting efficiencies without proposing new rules help guide efficient permitting. The Administration must reverse course on this flawed approach.

These changes are resulting in extended delays and creating a chilling effect on new infrastructure investment. TPI members appreciate the sector specific and narrowly targeted permitting reforms included in the new infrastructure bill, but they still face growing confusion from the constantly evolving federal rules and reviews.

TPI is concerned that the dividends from "build back better" are 7 to 10 years away, at the earliest. That extended timeline does not account for permits challenged in court and shows the need for Congress to step up to the plate and fix the permitting process.

While we have not yet seen the specifics of the Phase II NEPA rulemaking the Administration plans to unveil later next year after Phase I is finalized early next year, our concern is that it will place renewable and traditional energy infrastructure and generation projects at great risk.

When combined with other new proposed rulemakings and regulatory actions previously listed, it is difficult to find the win for new transmission lines and pipelines, solar installation, wind buildout, broadband deployment, and the expansion of critical minerals production to provide domestic sourcing for the manufacturing supply chain for these projects.

Recent reforms have showed limited results in reducing average permitting timeframes. It is critical to note that those reduced average timeframes are just the tip of a massive permitting iceberg. They do not capture all associated phases of the project development life cycle, the years of early engagement prior to formally commencing review under NEPA, or the years that can follow the Record of Decision. In short, these reforms improved permitting processes but also illuminated how many more opportunities remain to address the root cause of permitting delays and obstruction.

The negative consequences of only addressing parts of the statutory and regulatory process in separate, mutually exclusive, reform exercises are easy to see. On average, project developers report that 20 to 30 percent of total project funding is wasted by delays. The resulting cost overruns create an enormous disconnect between the funding Congress provides and private sector invests, and the ultimate delivery of the infrastructure America needs.

The cost of these pauses and restarts are rarely considered by lawmakers but estimates of the financial impact for major energy infrastructure projects begin at \$50 million per month in lost revenue. Add \$32 million per month in lost retainers on heavy machinery, architects, engineers, and construction crews who either sit stagnant or are reassigned to active jobs. Finally, tack on another \$50 million in annual costs as project sponsors adapt to shifting permitting goal posts requiring additional

studies and mid-project redesigns, broken contract penalties, interest on purchased materials along with financial consequence of delays. That cost is ultimately passed down to citizens, either through taxes, tolls, or increased rates and usage fees.

Greater efficiency DOES NOT mean fewer environmental protections. TPI is building a large coalition of diverse entities committed to a balance that respects the environment while increasing efficiency.

We are working with developers in every affected industry sector, officials at all levels of government, Tribes, non-government organizations, and community leaders to identify permitting "wins".

Congress can fix permitting problems by starting small with the creation of temporary initiatives to test new policies in the field under conditions ideal for compromise. One very achievable near-term step is to create a seven-year expedited permitting pilot program for a discrete list of the most critical projects, with focus on coordinating across all regulatory entities. Granting such an essential, yet temporary, new authority will create room to experiment with innovative and expedited permit authorizations. Outcomes can be scrutinized and studied by Congress for feasibility, then converted into more lasting reforms across all sectors.

Congress should also take a hard look at legislative reform initiatives such as the Builder Act, which clarifies the appropriate role for federal reviews at the state and local levels. To that end, TPI is working to expand the permitting-council model to state and tribal governments, emulating the success achieved in Arizona earlier this year. New state coordinating offices bridge the information and communication gap between state and federal regulators. States, local governments, and Tribes often have numerous overlapping permitting responsibilities and they are rarely coordinated efficiently. State, local, and tribal permitting requirements are often best addressed in the field where the project is located, equipped with critical firsthand knowledge and expertise about local resources. State permitting councils will allow local governments to bring the federal government to the table early in the process.

To be clear, opportunities for progress are directly in front of us. The creation of FPISC and improvements offered in the "One Federal Decision" framework were just the first steps.

Meaningful next steps to modernize and expand our energy infrastructure require that Congress enact comprehensive reforms that extend beyond NEPA to eliminate avoidable delays at all phases of a project.

A project development cycle of 7-to-10 years is simply too long. Working together, we can advance permitting reforms to build 21<sup>st</sup> Century infrastructure that safeguards communities, protects the environment and cultural resources, creates jobs, and brings prosperity to every corner of America.

Ms. CASTOR. Thank you.

Next, we will go to Ms. Jaffe. You are recognized for 5 minutes. Welcome.

Ms. Jaffe, check your audio, please.

Ms. JAFFE. Oh, goodness. Sorry.

Ms. CASTOR. There we go.

Ms. JAFFE. Okay.

Ms. CASTOR. Go ahead and start.

#### STATEMENT OF AMY MYERS JAFFE

Ms. JAFFE. Thank you very much.

Good afternoon, Chairwoman Castor, Ranking Member Graves, and the distinguished committee members of the Select Committee on the Climate Crisis. My name is Amy Myers Jaffe. Together with Dean Kelly Sims Gallagher, I lead U.S. and global climate policy research at the Fletcher School at Tufts University.

I have written several books on energy, including one on the link between the oil price cycle and global financial crises and, more recently, one on digital energy innovation.

I thank you for this opportunity to speak before the important committee today. And I thank Ranking Member Graves for referencing my testimony. I am glad to hear that he and perhaps other members of the committee are concerned about the undue in-



fluence of OPEC and Russia on global energy markets; that we don't want to have our own foreign policy, whether that is our climate negotiations at Glasgow or other kinds of strategic policies, held hostage.

We also similarly want to make sure that we are competing in global markets effectively with China. I think those are concerns that are bipartisan concerns, and I am going to talk about them today.

So the first thing we have learned on energy independence, which I have a nice little diagram in my testimony, is that if we provide extra oil supply, but oil demand is rising exponentially, we can still wind up with increased imports to the United States and instability in oil prices globally. And so really, truly, the best tool we have in our arsenal is demand management, and that in the past has been the CAFE standard, having our vehicles be more efficient. That helps families because they can buy less fuel to do the same trip.

And when we think about electric cars, we need to think about that same level of efficiency. Electric motors convert the vast majority of the energy that is stored in the battery, between 60 to 85 percent, into useable energy that moves the wheels and takes the car forward. By contrast, even a good internal—combustion engine is much less efficient. It converts only 40 percent of the gasoline fuel into useable energy, and then an additional amount of that energy is wasted in the form of your heating a drivetrain. And so we wind up actually only using about 20 percent of the energy from the fuel we burn in our car.

So, in effect, electric cars are a much more efficient technology. And, over time, the advent of electric cars in the United States and globally are going to remedy the influence that producing countries can have, undue, on global energy markets. That is a critical tool we have in our toolbox.

In the short term, we know what we have to use. We need inventories, we need diverse supply, we need backup systems. But longer term, we also know that public transit is an important part of making sure that every American has access to mobility and can't be held hostage to the cost raise that could be made on the international market.

And one of the things we know is that—which we learned sadly in COVID—is that, actually, of our most underserved communities, that 20 percent of low-income families don't even have access to an automobile and need services from public transit.

So when we think about build back better, we are talking about targeting exactly the needs we need to take to reduce the volatility we see in energy markets today.

Thank you very much.

[The statement of Ms. Jaffe follows:]

**BEFORE THE SELECT COMMITTEE ON THE CLIMATE CRISIS  
UNITED STATES HOUSE OF REPRESENTATIVES  
“CLEANER, CHEAPER ENERGY: CLIMATE INVESTMENTS  
TO HELP FAMILIES AND BUSINESSES”**

**December 9, 2021**

**Amy Myers Jaffe  
Research Professor and Managing Director  
Climate Policy Lab, Fletcher School, Tufts University**

Good afternoon, Chairwoman Castor, Ranking Member Graves, and members of the Committee. My name is Amy Myers Jaffe and I lead U.S. and global climate policy research at the Fletcher School at Tufts University. I have written several books on energy, including one on the link between the oil price cycle and global financial crises and more recently, one on digital energy innovation. Thank you for this opportunity to speak before this important committee.

I want to begin this afternoon by discussing what has caused recent energy price fluctuations. Unfortunately, it is not unusual for global energy prices to fluctuate sharply based on sudden changes in temporary market conditions. Notably, from 2005 to 2008, oil prices rose sharply, peaking at \$147 a barrel in July 2008 and then dropped sharply in 2009 following the global financial crisis. Although tensions in the Middle East contributed to oil's rise in the 2000s, detailed analysis of the period concluded that markets had experienced a “demand shock” driven by a sudden surge in demand for commodities due to unexpectedly strong economic expansion of the Chinese economy following massive urbanization and a construction boom in the runup to the 2008 Beijing summer Olympics. A similar run up in oil prices took place in 2014 when prices reached \$100 a barrel, as regional conflicts in Libya and elsewhere removed several million barrels a day suddenly. Oil prices collapsed in 2015 following a price war instigated by OPEC. U.S. natural gas prices have also fluctuated due to sudden surges in winter demand and production disruptions such as hurricanes in the U.S. Gulf of Mexico. For example, natural gas prices reached \$15 per million BTU in 2005, in the aftermath of Hurricanes Rita and Katrina.

The COVID-19 pandemic has caused extreme energy market disequilibrium. The global collapse in demand as a result of pandemic related lockdowns sent prices sharply lower, which then were given more momentum by a price war initiated by Saudi Arabia. The problem was so severe in March 2020 that oil producers struggled to find storage tanks to place their unwanted oil in. Oil prices fell to \$16 in April 2020. US gasoline prices followed suit, reaching under \$2 a gallon at that time. Oil companies and oil producing countries were forced to curtail drilling to alleviate the glut of unwanted oil. In the United States, domestic oil and natural gas producers also had to cut back rig operations as a result of the pandemic. In January 2020, there were nearly 700 rigs operating. By September, the oil rig count had collapsed 75% to under 200 rigs. Natural gas drilling also faltered, with rig counts falling by over 40%.

But eventually as demand made a sudden recovery in 2021, notably in the United States as economic growth skyrocketed at a pace of 6% increase in GDP, oil prices began to rise sharply. OPEC, led by Saudi Arabia, and Russia took advantage of the sudden imbalance of energy global supply and demand to create artificial price hikes to their geopolitical and financial advantage. **A primary driver behind major oil producing countries actions in recent months to create extreme energy price volatility was to try to convince political leaders in major economies to abandon plans to address climate change ahead of the Glasgow climate talks. Their motivation is clear. It is because those major oil exporting countries stand to lose geopolitical power and financial gain in the short run from successful global climate agreements. Their actions are not surprising but do harm to their own populations who are already subject to devastating extreme summer heat and localized flooding, and in the case of Russia, severe fires and permafrost melting in Arctic region.**

It is a large stretch of the imagination to say that these fluctuations that have been part of a structural and long-established boom and bust cycle in the oil and gas sector going back to the 1960s are currently the fault of the transition to cleaner energy. If anything, the addition of alternative energy helps us diversify our sources of energy, thereby reducing the market power of foreign oil producing countries within the OPEC plus cartel. Sadly, the energy transition has been slow to take hold, despite the crisis in rising global greenhouse gas emissions that are driving

climate change. Global climate policies have not substantially removed oil and gas demand yet; both demand for oil and gas and emissions are rising this year. Greater ambition towards climate action at the next two upcoming climate gatherings could lead more quickly to a decline in oil and gas use globally, depending on the suite of policies selected to implement deeper decarbonization. Still, at least for this year, and probably next year as well, energy transition risk to oil is more theoretical than tangible. Global oil and gas demand did not collapse last year due to the energy transition, and it didn't recover suddenly this year because of the energy transition. While it is true that intermittency in wind power temporarily affected Northern European markets last summer and a drought which curtailed hydroelectric power exacerbated energy shortages in China earlier this year, those events might have been more easily overcome if the economic recovery from COVID-19 lockdowns had happened more gradually or if Russia had proceeded with providing its customary levels of energy instead of strategically manipulating markets ahead of its troop buildup on the border of Ukraine.

#### *What are the best options for short term solutions*

The solutions to temporary fluctuations in energy market conditions are well known. The U.S. Strategic Petroleum Reserve (SPR) (and similar strategic stocks in the world's largest economies) were created to prevent a major oil exporter or group of exporters to threaten energy shortages to influence the foreign policy of oil consuming nations. Addressing climate change is an important element to US foreign policy. The Biden Administration correctly acted to tap the SPR, in conjunction with other major countries including China, India, the U.K. and Japan tapping their reserves at the same time, to prevent this geopolitically motivated manipulation of global energy markets. Congress has authorized the sale of 58 million barrels from the SPR by 2025. In light of current conditions, it did not make sense to delay the sales of this oil to 2024 or 2025. Selling a higher volume now provides a double benefit. It brings American consumers and the global economy immediate price relief, helping curtail inflation and preventing further financial strain on low-income economies already reeling from the pandemic. It also means the U.S. treasury benefits from selling oil when prices were high instead of waiting several years when prices could be significantly lower. The strategic stock sales announcement has helped push speculators out of the futures markets, reducing for now any undue upward momentum such speculation was driving.

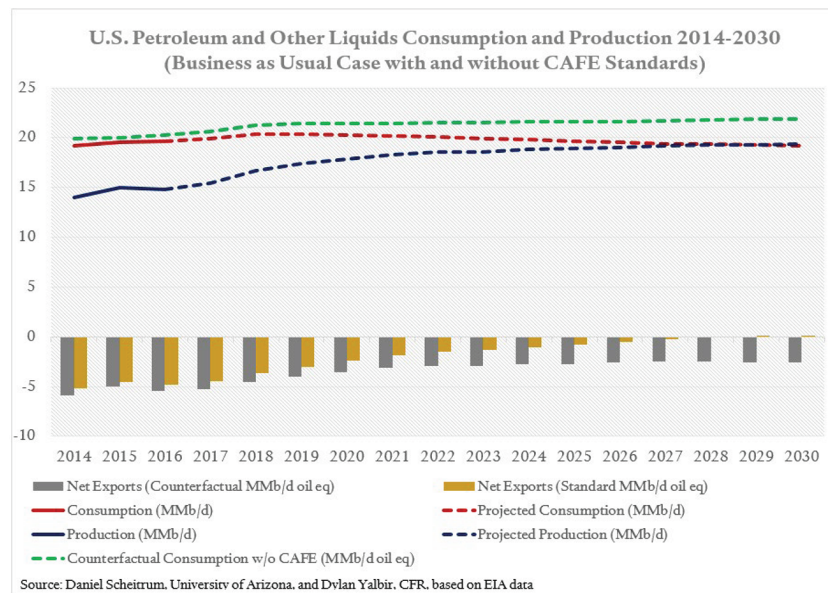
There are other levers that have been successfully used in the past to ease winter fuel shortages in the United States that should be considered. Temporarily waiving the Jones Act, which prohibits deliveries between U.S. locations to be carried on non-U.S. vessels, could ease bottlenecks in energy supply movements within the U.S. With limited supply of U.S. flagships, it can be difficult and expensive to find a vessel to ship fuels from one part of the country to another. Waiving the Jones Act temporarily has been used in the past to facilitate getting the energy American families need in times of shortages. The United States currently exports 5.5 million barrels a day of refined products, such as gasoline, heating oil, diesel fuel, and propane, to global markets. If that product is needed inside the United States, policy makers should act to facilitate that. Waiving the Jones Act would be one way to do this. Beefing up the U.S. Energy Administration's emergency preparedness work with industry leaders and states to identify and clear up supply bottlenecks and hasten inventory stores in preparation for winter would be another. In addition, rising costs of credits used to meet the Environmental Protection Agency's renewable fuel standards is adding to the price of ethanol used to blend for gasoline at the pump. The Administration could temporarily suspend the ethanol compliance credit program to ease the supply pressures. This is not to say that the aims that underpin the Jones Act or the EPA's ethanol programs are not important, just that temporary adjustments can have an outsize influence on removing bottlenecks from fuel availability and promoting easy distribution to Americans who need it most.

#### *Preparing for the future*

Given the financial losses stacked up from investment in oil and gas since 2015, investors and banks are more cautious about lending to drillers moving forward. Uncertainty about future market dynamics also contributes to hesitancy. However, a recent preliminary review by the Federal Reserve Bank of Dallas found that American oil and gas companies have been able to access bond markets at the same costs and availability this year than in the past. The U.S. rig count currently stands at 569, up almost 50% from last November, but still below February 2020 levels.

Years of study on energy security have identified various mechanisms to smooth anomalies in energy markets and ease shortfalls in supply. But it is important to note that strategies that focus solely on increasing supplies without addressing underlying drivers of excess demand will be ineffective. For example, even when U.S. oil production was surging strongly, it was the implementation of corporate average vehicle efficiency standards (CAFE) that limited internal U.S. demand and created the pathway for surpluses that could be exported to our allies and international markets, influencing global supply and pricing. Figure 1 illustrates the impact of CAFE standards on U.S. petroleum net exports trends by plotting how trends would have looked had the efficiency standards not been implemented (green line vs red line).

Figure 1



Better performance in energy efficiency, both in vehicles and in buildings and industry, lowers demand, potentially reducing the chances of energy shortfalls but also automatically reducing the burden of any rise in energy costs to consumers and businesses because it takes less energy to do the same task. Electric motors in vehicles are more efficient than traditional internal combustion engines. Electric motors convert the vast majority of their electric energy (60% to 85%) into usable power (e.g. movement). An internal combustion engine is much less efficient, converting only 40% of its gasoline fuel to usable energy. When losses in the form of heat in the drivetrain are considered, gasoline combustion vehicles only use around 20% of the energy from burning fuel into moving the car.

Just as vehicle efficiency standards have eliminated a measure of the potential increases in U.S. oil demand, promotion of EV sales in the United States would also reduce U.S. oil demand, increasing the chances that any lower investment in drilling for oil would be matched by similar decreases in the need for that oil. Virtually no oil is used in generating electric power in the United States.

The EV tax credit for new electric vehicles, Section 136401, and the tax credit for used electric vehicles for households of a certain means, Section 136402, and for commercial vehicles, Section 136403, in the Build Back Better legislation are important tools to accelerate wider EV adoption and thereby reduce demand for gasoline in a way that will contribute to lowering road fuel costs for all Americans. Many countries around the world have used credits of some sort to promote EV sales successfully, improving urban air quality and lowering carbon emissions while stimulating new jobs. The more individuals that make the switch to EVs, the lower the undue market influence OPEC Plus oil exporters will have in geopolitics and the

stability of global financial markets. The U.S. government can play a strong role in launching higher U.S. production and adoption of EVs by electrifying federal vehicles and the U.S. postal fleet, saving money on vehicle maintenance and fuel requirements through operational efficiency. These steps are important actions that have already been taken in other growing economies and should be considered a minimum competitive standard for an economy as diverse and preeminent as ours.

Some critics have raised concerns about the burden EVs will place on the U.S. electric grid. The U.S. power generation sector uses a wide variety of fuels including natural gas, renewables, hydroelectric, nuclear power, and coal. As the grid shifts to cleaner power sources, technology solutions will lower energy costs by reducing the costs of backup power for renewables, which in many locations can be produced more cheaply than traditional energy. We are also seeing new software solutions that can modulate demand management to shed electricity load at critical times to reduce surges in prices.

Many types of solutions already exist and have been deployed in different geographies. The recently passed Infrastructure bill incentivizes demonstration of some of these solutions, including battery storage, distributed energy solutions, advanced small modular nuclear reactors, and hydrogen conversion. But the scale of what is needed would be best addressed in broader climate specific legislation that can further target deployment in a manner that can best achieve cost reductions over time through scale economies and learning by doing cost reductions. Between 2015 and 2020, the cost for 60-cell monocrystalline solar photovoltaic modules fell by 60%. On-shore wind costs declined a further 26% over the last five years, following sharp declines in previous decades. Offshore wind costs have fallen by 50% in key locations since 2014, with experts predicting a further 50% drop by 2050.

To keep the lights on and energy prices low, backup systems and system redundancies are needed no matter what energy fuel is used. It is a myth that gasoline is not affected in a power blackout. It takes electricity to run the vast gasoline distribution system in the United States, including wholesale terminals and retail stations that cannot deploy any supply without electricity. The final findings from the Texas electricity crisis were that firms did not have sufficient levels of natural gas inventories on hand to keep the grid afloat once the freeze curtailed ongoing natural gas production. More rechargeable battery storage or stored hydrogen that could have been run through a fuel cell might have eased the problem, not made it worse. We know how to backup energy generation capacity. What's needed now is a national effort to lower than costs of doing so. Europe and China are investing hundreds of millions of dollars to get there. The United States could lead.

The United States needs to capitalize on its current private sector technological edge to become the leading purveyor of the hardware and software that is going to revolutionize electricity markets in the coming decades. Projections are that global energy use in the form of electricity will rise to 50% by 2050, up from 20% today. The United States needs to invest more heavily in energy innovation and grid modernization in stay out front of that energy trendline. Our aged and failing grid puts us behind other major economies. U.S. companies have leading technologies in solar, micro-grids, and virtual power plants that allow firms to buy surplus energy capacity from rooftop solar panels, electric cars and battery storage systems and then sell it back to the grid when extra power is needed to avoid soaring prices or brownouts. There are automated software solutions that can program in power demand management practices to balance grid supply and demand more effectively, reducing waste and lowering costs to consumers. For example, Google is pioneering such technologies that would help residences modulate their electricity use tapping automation to better match availability of renewable energy output. Data assisted, digital technologies, properly regulated, also portend a greater ability to reduce energy use from daily transactions via smart appliances and equipment, optimized e-commerce deliveries, and improved supply chain management. We need to make the public expenditures in grid modernization, broadband, and technology promotion to make these technologies available at affordable cost to benefit all Americans and to create export products that will support American jobs.

Another key to lowering energy costs for average Americans is to improve availability and reliability of mass transit systems. Roughly 16% of all oil used in the United States goes to commuting by car. Traffic congestion is responsible for billions of gallons of wasted fuel (3.5 billion gallons in 2019). With a quarter of Americans still telecommuting, transit authorities need to reorganize routes and services to prioritize providing affordable transportation to essential workers who cannot do their jobs remotely. Collapse of public transit would have an extremely detrimental impact on families and on sustainability in cities, raising energy costs for workers.

The Build Back Better Act includes \$9.75 billion in grants to enhance access to affordable housing and improve mobility for lower-income individuals and residents

of disadvantaged communities. One very important element in the bill is support to transit authorities to expand areas of service and high frequency of service including rapid bus systems. Forward looking localities are experimenting with on-demand oriented services facilitated by big data and user smart phones to increase ridership and to modernize reliability. Fare free and reduced fare services are another tool small cities have used to improve mobility accessibility. Grants to promote zero-emissions bus service in disadvantaged communities lower oil use and bring positive health impacts. Investment in public transit is an essential tool lowering energy costs through reduced fuel use, lower congestion, and greater urban accessibility.

### Conclusion

The energy transition is a global phenomenon now gaining momentum given the urgency of the climate crisis. To quote from my book, *Energy's Digital Future*, "The genie is already out of the bottle on these [smart, clean energy] technologies. There is no benefit to allowing traditional energy incumbents to push the United States to go backward to save jobs. This is a formula to transfer those jobs to other countries that will be glad to fund or overtake U.S. intellectual property and move promising technologies forward, first in their own countries and later in the form of export products. These products would then go back to the United States as imported goods for American use made by workers in other countries . . . This time around, maintaining U.S. innovation culture will be just as important to maintaining America's power and influence globally as it has been in past eras of rapid technological change. The United States can decide not to lead on the technologies that will be needed to arrest climate change, but that means other countries will."

Ms. CASTOR. Thank you very much.

And I want to thank all of our witnesses for your very insightful and informative testimony.

I am going to start by recognizing Representative Casten first for 5 minutes. You are recognized.

Mr. CASTEN. So thank you very much. And before the clock starts, my conflict has been shuffled, so I am happy to go first, but I don't want to impinge on you if you would like to go.

Ms. CASTOR. Please go ahead and set the table.

Mr. CASTEN. All right. Thank you.

Ms. Ballentine, it is such a pleasure to see you and have all your expertise here. Learned so much from you through the years. And I mention that in part because I want to apologize because I am going to start at a second grade reading level because I don't want to lose any of my colleagues.

If I am looking right now, I am just googling on my phone, Henry Hub spot price of natural gas, \$3.76 per million BTU. The price of coal has surged. It is about \$133 a ton. If I am doing the math right, that is almost \$650 per million BTU. And I can't find a spot price for sunlight and wind.

Am I correct in assuming that the price of sun and wind is zero per MMBtu?

Ms. BALLENTINE. You are correct.

Mr. CASTEN. Thank you. I was glad I didn't look at that wrong.

The price of power is averaging about \$49 a megawatt hour right now. So it sounds to me like if we built solar and wind panels, that we are using zero cost fuel and turning it into something worth \$49, we would generate a return on investment. Do I have that about right?

Ms. BALLENTINE. I am going to trust you on that.

Mr. CASTEN. Well—

Ms. JAFFE. 7 to 12 percent return.

Mr. CASTEN [continuing]. Yeah. Thank you very much.

Ms. JAFFE. You would earn a 7 to 12 percent return.

Mr. CASTEN. I appreciate that. Okay. So, now, if I—I think the price of solar and wind right now is running a thousand dollars a kilowatt, maybe, installed, something in those neighborhoods. And the last time I looked, transmission and distribution, the full system—is a weird way to look at it, but I did a little piece of math—roughly \$1,500 per delivered kilowatt, when you sort of run through the whole system. Ballpark-ish?

I see some heads nodding. Okay.

So almost basically more than half of the capital cost we have to amortize in the system is the transmission system. And I quite agree, I think, with all our witnesses, that permitting is a real problem, and it is a big chunk of that cost.

We did have, in the American Jobs Plan that the President proposed, a Standard Office of Transmission. Unfortunately, we didn't get that in a bipartisan package, and we can't do policy under reconciliation. But I would hope on a bipartisan consensus, we can streamline that permitting process in some future bill.

My first question, though, for you, Ms. Ballentine, is—we run about 7 percent losses in the system on the transmission and distribution grid. And so if more than half of the cost of the system, that is going to lower our cost of energy, because I think we just said 12 percent return—great—that exceeds GDP, let's do it. But if more than half of that cost to the system is in the transmission system, and we are losing 7 percent of it on the way from the generator to the load, are we doing enough to make sure that we are first building generation closest to the load where we can avoid those losses, or are there other things we should be thinking about in that regard?

Ms. BALLENTINE. So I would answer your question directly that we are not doing enough in two regards. You are right, we should be looking at building generation close to load. No question about it. However, as we know, that zero marginal cost—wind, solar, geothermal, hydropower, you know, there is a whole suite, not just wind and solar, of zero marginal cost renewable energy sources, they are not evenly distributed across the country.

Mr. CASTEN. Sure.

Ms. BALLENTINE. So we have to invest in advanced transmission as well. It is a critical piece of the pie. And today, in our connection cues are slowing down electrons getting from where projects can be built to where customers' loads are.

Mr. CASTEN. Yeah.

Ms. BALLENTINE. We need two to three times the transmission that we are going to have today, and every bit of investment that is in this Act is going to help that.

Mr. CASTEN. Well, I quite agree. And thank you for raising the point. And I just want to make sure, and as my colleagues know, I am a big fan of the Federal Energy Regulatory Commission. I hope that they can streamline some of these permitting processes and make sure that we build the transmission where it should go in a streamlined fashion but also fix those downstream market issues.

Ms. Jaffe, I want to start again—and I apologize, this is so simple—all else equal, if demand goes down, does price go up or down?

Ms. JAFFE. If demand goes down, price goes down.

Mr. CASTEN. Awesome. So if we reduce the demand for natural gas by building solar and wind, if we reduce demand for oil, we are going to lower the price of gas and oil, right? Do I have that about right?

Ms. JAFFE. That is correct.

Mr. CASTEN. Awesome. Mr. Graves will be so delighted. We are going to lower the price for consumers across the board. This is fantastic news.

Now, if you could just help us out, Ms. Jaffe, because as I look at the last 7, 8 months, it looks like the demand for natural gas in the U.S., the demand for oil has not dramatically increased, and yet the price has gone up, and wellhead counts have fallen and exports have surged.

Can you explain to us how it is that collapsing wellheads and surging exports might account for some of the increase in fossil fuel prices over the last 7 months?

Ms. JAFFE. So I think the way you have described it is not really accurate. What actually happened is we had a huge unprecedented collapse in demand for both oil and natural gas in 2020 because of COVID. Many American companies stopped drilling, not having anything to do with Federal policy but simply because there was no demand because of COVID, and they were losing huge amounts of money. And then because of the success of the vaccine rollout, we had a sudden reopening of our economy. We had 6 percent growth, which is unprecedented. I think a lot of—I can't think of the last time, maybe the Fifties, when we had 6 percent growth in the United States.

And that sudden—resurgence of sudden demand in the United States, more people driving their cars, meant that we, together with the recovery in the rest of the world, created a situation where the cutbacks that we saw in 2020 could not be immediately reversed. That gave OPEC power, and they used that power.

Mr. CASTEN. Thank you. I am over time.

I yield back. We could do this conversation for a long time, but greatly appreciate all your expertise.

Ms. CASTOR. Next, Mr. Crenshaw, you are recognized for 5 minutes.

Mr. CRENSHAW. Thank you, Madam Chairwoman. Thank you all for being here.

I want to talk about what lowers costs for Americans and how to build that infrastructure that does so, because we keep hearing that the Build Back Better plan and the infrastructure plan that was passed will lower costs for Americans. This is repeated so often that it supposedly becomes self-evident, but we have to ask how. Because this argument is based on the notion that spending more Federal money actually makes these projects easier to execute.

Somebody has to ask, is that actually true?

Now, you could argue that better infrastructure certainly lowers costs, but the infrastructure has to be built. It actually has to happen. And as Americans are experiencing the highest cost of electricity in the last 20 years, I want to know how the Build Back Better agenda will actually reduce costs, not just by spending money, but by making projects easier to complete.



So, Mr. Herrgott, we will start with you, please, and thank you for being here. During your time at the permitting office, what did you find was the single largest threat to getting a project completed?

Mr. HERRGOTT. Well, I thank you for that question, Mr. Crenshaw. I think that there is a bit of a disconnect between the world that everyone wants to live in and the one that we actually live in. And the one that I live in, and in the Trump administration in particular, and although it was little known, we pushed some of the largest wind and solar projects in the history of our country, right? Some of the largest in the world, even though it got me in a bit of trouble.

But the reality is that it takes 7 to 10 years. For a project that starts today, what do we do in that 10 year period, especially now that we have supply chain issues that we can't actually address. So at the same time that we are talking about demand and supply issues and a recognition of where that might increase prices, at some point, if you are going to put—you can't throw good money after bad.

At some point, we have to have a road map. Whether it is wind, solar, transmission, my entity is agnostic. But the bottom line is, if people are putting capital at risk on whatever energy source that comports with the stated national policy and the changing priorities of the whims of elections, we have to remove this.

Because those 20 to 30 percent of costs are things that we have to solve and that are not going to solve themselves, and, apparently, nobody wants to talk about it in a real way. And those kinds of costs are the ones that are borne on utility bills. And those are the things that I haven't seen addressed by either side, either in the draft versions of the infrastructure bill or in the current Build Back Better plan.

Creating a new office within an agency doesn't solve a problem. All right? Calling something shovel-ready without making it shovel-ready doesn't do anything for the American people.

Mr. CRENSHAW. Right. And that does get to a question I was going to ask about the claim that the infrastructure bill took care of these process issues. But you are saying it does not?

Mr. HERRGOTT. Well, while I was in the administration, I drafted something called "One Federal Decision," in a recognition that we needed to bring this disparate universe of decision makers and have one adult in the room that would actually drive the process, no shortcuts to the environmental reviews, but that there would actually be, not necessarily yes, but a decision given in a reasonable amount of time.

One Federal Decision was codified in the most recently passed bill, but that is only for DOT projects.

The Federal Permitting Council, which I ran, which is an extremely successful tool, and Christine Harada, who currently runs it, is exceptional at her job. The problem is it only has eight projects, six wind and one transmission. And it is only for projects that are \$200 million and above.

Those are very targeted, narrow tools. What do you do with the other 2,000 projects that are stated to meet the 2030 climate goals

that are sitting in a period of limbo, with no one giving them a hand? And those are on both—those are both our faults, frankly.

Mr. CRENSHAW. Last thing I want you to talk about is how our court system is weaponized and what we do could do to streamline the process which would avoid that.

Mr. HERRGOTT. So thank you for that question. There is currently about 1,200 cases that are direct contributors to a renewable energy future that are currently in active stages of litigation. Whether that was the most recent rescission of the Migratory Bird Treaty Act that makes it now a criminal penalty to have an incidental take of even one bird, has paralyzed offshore wind development and wind development in Nevada.

And solar is the same issue, is being impacted by new changes to the sage grouse. Not even just the NEPA rules that everyone talks about, it is the 60 other permits that are required here that have now created an uncertain regulatory landscape because project developers have to get everything right.

Those that don't want the project only have to get one thing wrong and there is a process foul and they can hold up a project for about 2 years, which oftentimes lead, about 30 percent of the time, to project abandonment.

And in that case, if we don't solve this issue, we are going to continue to have—we are going to continue litigation and have courts making science based decisions, adjudicating things that should be solved either by Congress or by the scientists in the agencies that make these risk-based decisions.

Mr. CRENSHAW. We could talk about that for a lot longer—and we have, you and I—but I am out of time.

So I yield back. Thank you.

Ms. CASTOR. Thank you.

Next, we will go to Representative Bonamici. You are recognized for 5 minutes.

Ms. BONAMICI. Thank you, Chair Castor and Ranking Member Graves. And, really, thank you to our witnesses for your testimony today.

We know the financial and social cost of fossil fuels. Millions of deaths annually are attributed to burning fossil fuels, and without intervention, according to the Fourth National Climate Assessment report, warming could contribute to an 18 percent increase in ratepayer electric bills by 2040.

But, fortunately, the Build Back Better Act's climate change provisions will reduce costs and reduce health problems.

So I want to ask Dr. Varadarajan, your RMI modeling that you cited in your testimony reveals that the Build Back Better Act will help ratepayers see an annual savings of about \$11 billion per year by 2030 as utilities transition to clean energy.

So how will these savings be distributed geographically across the country, and how will these savings help lower-income households and support a just transition? And also, does that \$11 billion in projected savings depend on enacting the Build Back Better Act?

Dr. VARADARAJAN. Thank you so much for the question. To that last point, we certainly believe that the bulk of those savings do indeed depend on the enactment of the Build Back Better Act.

The way in which these savings are distributed is impacted by the fact that, you know, we have spoken a little bit about how existing tax incentives or existing policies have been uneven in leading to clean energy deployment across the country, that there have been these barriers to moving forward.

Well, some of the biggest barriers have been related to the way that these incentives have been structured. And in particular, these incentives have been structured to make it difficult for the customers of municipal utilities, for rural customers of rural cooperatives, as well as customers of regulated utilities, to benefit from clean energy in the way that we hoped they could.

And one of the things the Build Back Better Act does is break down some of these barriers to allow these communities that have so far not been able to have access to clean energy. And when we look at where these communities are located, they are, in fact, very well co-located, they are communities that have some of the highest energy burdens in the country.

So when we look at the utilities, for example, that might—whose customers may see the greatest savings, some of these utilities are utilities in Wisconsin, in Florida, in Indiana, in Georgia, and in Virginia, utilities in Alabama. These are customers who haven't had the opportunity. And what the Build Back Better Act does, is it makes some strategic and important shifts in the way that those incentives are structured to bring those benefits to those who would benefit the most from them over time.

Ms. BONAMICI. Thank you so much. I appreciate that, and I appreciate your testimony.

Ms. Ballentine, in your testimony, you cite an analysis of 11 studies that confirms the feasibility of reaching 80 percent clean energy by 2030 at a minimal cost. To bridge the gap between 80 and 100 percent energy deployment, we need to invest in major innovative breakthroughs that will reduce emissions in hard-to-decarbonize sectors.

So Build Back Better will help achieve this challenge by providing \$2 billion for Department of Energy research and development and other investments in innovation.

So for you and Ms. Jaffe, what are the most important innovations that we need to materialize for us to exceed the 80 percent decarbonization? And how will the provisions in Build Back Better support clean energy innovation?

Ms. BALLENTINE. So I will mention two things. One of the most important innovations is probably one of the most boring because it is not an innovation. We need to expand wholesale organized markets to every region of the country. We often forget about the importance of competition to accelerate clean energy, and we know that wholesale markets lower costs—building on Dr. Varadarajan's comments, we know that wholesale markets lower costs, and expanding wholesale markets to every region of the country will make a big difference.

Now, in terms of technology, when we think about how we are going to decarbonize the grid, how we are going to plan for threats in the future that look different than threats in the past, whether it is change in weather patterns or whether it is determined adversaries that can attack our grid from anywhere in the world through

cyber, we need to be thinking about our grid in a very, very different way.

We have customers who are also producers now—prosumers, we call them. We need a much more agile grid that can respond to customers producing their own power and using their own power. So we need software and hardware.

Ms. BONAMICI. I want to turn to Ms. Jaffe for the remaining 20 seconds. Thank you.

Ms. Jaffe. Innovations?

Ms. JAFFE. I mean, there is so much potential. To mention the question of transmission, there is even an innovation where there is a new technology out on the market that would allow us to transmit electricity in major wires without the 7 percent loss. So a lot of innovation can take place.

Ms. BONAMICI. Great, thank you, and I am out of time.

I yield back. Thank you, Madam Chair.

Ms. CASTOR. Next, we will go to Representative Miller. You are recognized for 5 minutes.

Mrs. MILLER. Thank you, Chair Castor, Ranking Member Graves. And I appreciate you all for being here today with us.

While many Americans across the country suffer from rising inflation, increasing gas costs, and higher prices on every product and service they rely on, the Democrats today want to twist the knife in the wound of the American middle class.

In the build back broke agenda, one of the costliest provisions in the entire bill is a tax cut for millionaires and billionaires living in high tax states like California and New York. This tax break is offset by raising taxes on the middle class workers across our country, increasing the cost of their necessities and especially their energy.

No matter how many times we have what seems to be the same hearing, discussing the same flawed logic proposed by my colleagues across the aisle, we are not fixing the real issues. It feels like the movie Groundhog's Day.

Instead of focusing on viable solutions to lower emissions, many of my colleagues only seem to focus on pie-in-the-sky fantasies of a world run solely on specific renewable energies.

We need an all-of-the-above strategy which focuses on key base-load energy and affordability, while still being responsible stewards of our environment.

As winter begins to take hold across the country, the United States is not prepared to supply our nation with the energy it needs to keep the lights on, heaters warm, and water running.

Liberal energy policies have stymied investments, forced banks to withhold credit to traditional energy companies, and created a never-ending regulatory nightmare, where it takes years for new lower-emitting projects to even get started.

As I say often in the hearings in this committee, I am not opposed to renewable energy. I am committed to lowering emissions through smart, market-driven forces.

While I appreciate my colleagues across the aisle acknowledging that lowering taxes promotes business growth and technology development, their insistence on only lowering taxes for their pet industries is a disturbingly—a new trend.

The build back broke agenda will increase taxes on all companies in the United States, whereas the Republican Tax Cuts and Jobs Act stopped corporate inversions, the takeover of U.S. companies by foreign companies and competitors. The BBB will make U.S. companies less competitive, again sacrificing American intellectual property and U.S.-owned companies to overseas money.

We must do more to move into this reduced-carbon future the right way. Carbon capture technologies will mitigate the impacts of traditional energy sources without giving up American energy independence, and brings along our energy-producing communities, like mine in southern West Virginia.

This committee and this President and his administration must commit to commonsense energy policies, not kneeling at the feet of radical progressive idealism.

Mr. Herrgott, would you say that energy projects, whether they be pipelines, export terminals, or power plants, that are built today are more efficient and less carbon emitting than those built decades ago?

Mr. HERRGOTT. Yes.

Mrs. MILLER. Can you explain to me, then, if these newer projects would emit less emissions, why is there not a push to streamline the permitting process to get these projects online faster?

Mr. HERRGOTT. Well, thank you for that question. Up here you see a pipeline chart that is from the administration that talks about the 80 steps that need to take place. These are the same steps that also afflict transmission. There is no difference between the permitting regime that affects clean energy transmission and pipelines. And so the reality, however, is this still takes 7 years to do.

Mrs. MILLER. That is too long.

Madam Chairwoman, I yield back my time.

Ms. CASTOR. Thank you very much.

Next, we will go to Representative Brownley. You are recognized for 5 minutes.

Ms. BROWNLEY. Thank you, Madam Chair. Thank you for putting this hearing together.

Ms. Ballentine, I wanted to ask you, we talked a lot about—in your opening comments, you talked about how your organization certainly supports the Build Back Better plan, et cetera. Get that. We have talked about permitting barriers, fixing the permitting system. You have talked about the transmission infrastructure needs to increase by two to three times.

So what I am interested in knowing is, from your membership, what are some of the other—you know, what are some of the other issues that Congress should be looking at?

Ms. BALLENTINE. Thank you for that question. And I actually loved a couple of quotes from your colleague's previous remarks. Smart, market-driven forces, all of the above. CEBA couldn't agree more with those kinds of comments, so, thank you, ma'am, for bringing those to the table.

The largest barriers to energy customers using their market demand to drive carbon-free, low pollution to no pollution, low-cost, reliable power, is lack of markets. Eighty percent of wind and solar

has been deployed in wholesale organized markets today. And that is not because 80 percent of load is in organized markets. Only about two-thirds of load is in organized markets.

Without competition, without choice, markets can't work, and customers can't help. So that is the number one barrier.

Certainly, getting steel in the ground faster, getting projects done faster, is a critical component as well.

But I would come back again and again to organized markets and transmission. We need those two things to make this market work.

Ms. BROWNLEY. Great. And just on a separate point, I have been a member who has worked on sustainable aviation fuel, and it has been a very interesting journey because the—you know, certainly the environmentalists are supportive and the airlines industry now, particularly United Airlines, who is really leading the way on SAF and are really very much committed to it.

And so we have a blender's tax that hopefully will stay in the Build Back Better that will help to develop this market because that is what we need. I mean, in the aviation industry, that is—for the short term, medium term, this is really our only solution in terms of reducing carbon.

So can you tell me what other things are needed to develop that market?

Ms. BALLENTINE. So I haven't worked on aviation fuel in a number of years. I will say that there is a parallel organization that has actually been established at Rocky Mountain Institute, called the Sustainable Aviation Buyers Alliance, that does very similar work to the Clean Energy Buyers Association, and it brings together consumers of aviation services to drive demand for low- and zero-carbon aviation. So, again, putting these markets to work is a critical component.

Additionally, what we found when I was back in the Air Force, was, even though we had certified our aircraft to fly on a full range of aviation fuels, our partners and peers around the world hadn't. And so when we have our colleagues on our bases, we have to have fuel that works in everybody's airplanes. So this has to be a global solution.

Ms. BROWNLEY. Thank you very much.

And, Ms. Jaffe, I wanted to ask you, I, you know, was delighted in your testimony and your comments really about mass transit, the need for mass transit, and the ability of mass transit to ultimately reduce costs to consumers.

Several of us sit on the Transportation Committee. We were pretty disappointed with the amount of money that ended up in Build Back Better towards mass transit. We wanted to—you know, we needed—we wanted to repair our roads but not build new roads. We wanted to put all of that money into transit systems.

So based on what we have in Build Back Better, do you think it is going to make a dent? I am just curious to know, I mean, there is, you know, money in there for electrification of transit systems and certainly money in there for lower-income areas and some money for mass transit. But what do you think we really need to do?

Ms. JAFFE. Well, you know, there is something in the bill that really caught my eye, which is helping transit agencies really upgrade evening service and services for the people who really need it. And one of the ways we do that is to modernize.

So that means, you know, being able to use, you know, your smartphone apps and being able to connect to people in a way that your scheduling transit in a really effective and productive way. And that does require to be able to have the transit authorities have the funding to be able to do that, and I see some of that in the bill. I think that that is important. Maybe having that be a bigger part could be a very positive thing.

And, also, just recognizing that when we build highways, you know—and I have lived many years in Texas, and you know, thanks to Tom DeLay, the traffic in Houston today is much, much worse than it has been. Every time they expand the lanes, you know, what we learn is it just takes up more and more vehicles, and so you get more and more congestion, which means more and more ways to fuel, which means more power to OPEC.

So transit is really an important part of breaking that cycle. And, also, you get to the point in big cities where the traffic is so bad, you really don't have any choice but to take transit because otherwise you can't reliably go anywhere. And so it is really an important piece.

Ms. BROWNLEY. Thank you.

I apologize, Madam Chair. I yield back.

Ms. CASTOR. Thank you.

Next, we will go to Representative Gonzalez. You are recognized for 5 minutes.

Mr. GONZALEZ. Thank you, Chairwoman Castor and Ranking Member Graves, for holding this hearing today and for our distinguished witnesses for joining us.

I was told I could go if my questions were intelligent. I make no promises.

There is one thing all large scale energy transitions have in common, and it is a great deal of inertia. Under most circumstances, energy transitions take decades to achieve. And the greater the reliance on one or two energy sources, the longer the transition tends to occur. That is a historical fact.

While this simple truth may seem obvious, it does seem to go ignored. Overlooked are things such as the scale of the shift, any social and economic implications, the lower energy density, the replacement fuels, the inherent intermittency in renewable energy, and the uneven distribution of renewable energy sources.

Every transition to date has introduced fuels with superior energy densities, but the one we are discussing today moves us in the other direction.

Barring some extraordinary unprecedented innovation, I am skeptical that we are going to achieve these targets. I say all that while believing a world with less carbon-emitting sources is highly desirable, and the goal is a noble goal. But I do believe we have to recognize that getting there is going to require a suite of technologies.

And if there is one disappointment I have with the hearing, frankly, it is I saw the title and I thought we were going to have

a really deep dialogue about how do we actually fund the transition, what the right mix of private and public investment are, where those sources need to come into place. And then I read the testimonies and it seems like it is basically just a selling exercise for Build Back Better, which we all know is a partisan bill.

That said, now to my question.

Dr. Varadarajan, I would like to start with you because, in your testimony, you state cleaner energy sources such as wind and solar, complemented by battery, offer energy price stability and could create durable energy savings for American households.

I think “could” is the operative word in that statement. I would like to dive into that with you, because what I am most nervous about when I look at Build Back Better and I see the mission of many of my Democratic colleagues that focus on wind and solar—wind, solar, and battery, is that we end up being like Germany, where a perfect case study for examining the ROI on subsidizing certain technologies.

It committed more than \$560 billion in wind and solar, yet just 42 percent of its electricity from nonhydro renewables. Large-scale energy storage remaining inefficient and expensive, efficiency rates have plummeted, and electricity prices have doubled.

In the first half of 2020—the first half—Germany’s electricity prices were 43 percent higher than the European average. In response, Germany is actively mining and producing a record amount of brown coal and increasing their consumption of Russian natural gas. The result, a 21 million ton increase in German emissions from electricity in the first 6 months of this year.

So here is the question: Why should we believe the Build Back Better proposal won’t make the same mistakes as Germany, raising household energy costs and increasing our reliance on foreign fossil based energy sources?

Dr. VARADARAJAN. Well, I think the most important point here is that the United States isn’t Germany. Germany has the solar resources—

Mr. GONZALEZ. But, sir, we are pursuing the same strategy.

Dr. VARADARAJAN [continuing]. Germany has the same solar resources as Alaska. We have the Saudi Arabia of wind in the middle of this country, in the Great Plains states. We have resources just in Arizona that are sufficiently good solar resources. They could power about a hundred kilometer by a hundred kilometer square. Arizona alone can power the grid across the United States.

We are blessed with some of the best solar and wind resources in the world, something that Germany and most European countries can’t even come close to. It is because of our prosperity and our incredible—of the lands that we have that we are able to do something like this and do it in a way that lowers costs over time.

And, thankfully, technology has changed. Germany made these investments when solar was 10 times as expensive as it was. We are now able to make these investments when, if I look out at the cost of clean energy right now in the United States, if I am trying to build some kind of new energy, you know, even independent of policy, forgetting about all of that, the lowest cost choice on a per-kilowatt-hour basis right now is to build solar and wind in most



of the country. But not everywhere. I do think—and this is a reality—

Mr. GONZALEZ. Reclaiming my time for a second—

Dr. VARADARAJAN [continuing]. Sure.

Mr. GONZALEZ [continuing]. Because I have a question on the—so I agree we are not Germany obviously, right? We have areas of the country that have a ton of wind generation capacity and others that solar would be beneficial for. But you still have to transport it around the country, right? Where I live in northeast Ohio, that is not the case. We have a lot of cloudy days, and we don't have as much wind.

So talk to me about how confident you are that we could do all this and not have the cost increases, knowing that you are going to have to transport it across. And I am seeing I am running out of time so maybe I will follow up in writing with that.

Dr. VARADARAJAN. Be happy to—

Mr. GONZALEZ [continuing]. But I think it is something that we should all have on our minds.

Thank you, and I yield back.

Ms. CASTOR. Thank you.

Next up is Representative Levin. You are recognized for 5 minutes.

Mr. LEVIN. Well, thank you, Chair Castor. I appreciate your holding today's hearing on such an important and timely topic.

As my colleagues have noted, the Build Back Better Act represents the single largest investment in climate action in our nation's history, and I am really proud of the work of this Select Committee in making sure that we are able to pass such a transformational bill through the House.

But today's hearing underscores what I think we already know, that the Build Back Better Act will create millions of good-paying jobs right here in the United States and reduce transportation and energy costs for American consumers, while making sure that we can stave off the worst effects of climate change. That is why it is so critical that the Senate seize this critical opportunity to act on climate and put our nation on the pathway to a zero carbon future.

With that, I will turn to my questions, and I will start with Ms. Jaffe. You noted in your testimony how the oil and gas industry operates in a boom-bust cycle. As we know, the pandemic has put that cycle on overdrive as gas prices dropped dramatically last March before rising precipitously earlier this year as we began the vaccination campaign.

However, these dramatic swings in prices are not unprecedented. Over the last 15 years, we have seen dramatic shifts in energy costs due to global financial downturns, regional conflicts, and severe weather events. And while my friends across the aisle may allege that policies intended to address climate change are the main cause for the current price increases, the facts simply say otherwise.

Rather, it comes down to economics. As COVID-19 emerged last year, many operators cut supply dramatically and have not been able to meet the rapidly increasing demand since the beginning of the vaccination campaign. Compounding this was OPEC-plus' failure to reach an agreement on substantial production increases, and

the fact that domestic supply remains relatively low because investors and banks remain worried about a full resumption of operations, given the losses that they have mounted since 2015.

At the same time, oil and gas companies are reporting record profits, even as they choose not to increase production to meet the demand. This has even prompted President Biden to ask the Federal Trade Commission to investigate whether these oil and gas companies are illegally increasing prices even as the price of unfinished gasoline continues to drop.

And while the U.S. Energy Information Administration predicts that we will see gas prices continue to decrease over the coming year, if we do not rapidly decarbonize our economy, I worry—I worry—that the fossil fuel sector’s boom-bust cycle will become even more pronounced in the years ahead as both greenhouse gas emissions and the frequency of extreme weather events continues to rise. The result will be the continuation of this never ending roller coaster of supply swings and price changes as the American people bear the brunt of unpredictable fossil fuel costs and its associated negative environmental impacts.

So, Ms. Jaffe, with that context, in your testimony, you noted that transportation electrification can help us reduce demand for fossil fuels and keep transportation costs in check during the energy transition, which can be helpful for low income families that often experience the greater energy burden.

Can you please expand on that statement, and specifically, how can investments in electrifying our transportation sector, along with parallel investments in electrifying our grid, help protect American families, especially low-income households, from the volatility of the oil boom-bust cycle?

Ms. JAFFE. Well, as has also already been stated, you know, we are going to have these resources. I mean, the great thing about renewable energy is it is inside your border, and it is close in. I mentioned but didn’t seem to fully come across that electric vehicles are just technologically so much more efficient in how much they utilize energy and how they utilize energy. The fact that gasoline is somehow more energy-dense doesn’t matter because the vehicle itself is so much more efficient.

But then to add to the point, which I feel I always need to make, which is that I have lived in Houston, I have lived in northern California with the fires, I have lived in New England. And I can tell you, having been through multiple hurricanes, that you need electricity to distribute and use pump gasoline from a retail level.

And so, you know, there is no advantage, in a way, to the gasoline from a logistical point of view when it comes to storms and resiliency and so forth because you need the same electricity. Indeed, if you had an electric car and you had a system for backup electricity, you were in a community solar project or you were somehow able to access electricity, you would at least be able to use your car because you would have that electricity for your car. And you wouldn’t have to worry about whether some giant company was able to electrify all the retail stations near your house.

So, you know, we are really moving to what I think will be a superior technology, and that is going to benefit everybody.

Mr. LEVIN. Well, thank you, Ms. Jaffe. I am over time, but I wanted to let you roll. I appreciate very much your reply and all our witnesses and my colleagues.

And I will yield back.

Ms. CASTOR. Next up is Ranking Member Graves. You are recognized for 5 minutes.

Mr. GRAVES. Thank you very much, Madam Chair.

Mr. CASTEN, I am hoping to get to second grade level next year. I am trying hard.

So, Ms. Ballentine, I want to make sure I understand something, so let me ask you a question. If you are a retailer and I am your supplier, and I increase my cost to you, what are you going to do with that increased cost you are paying for the product?

Ms. BALLENTINE. Are you talking energy in particular?

Mr. GRAVES. Sure, whatever. Energy is fine, yes, that is fine.

Ms. BALLENTINE. You pass it on to the customer.

Mr. GRAVES. You pass is on to the customer. You pass it on to the customer.

So if the Build Back Better Act imposes a tax of \$10,000 a mile a year for pipelines, that is an increased cost. And so companies are baking that in now. If you are going to increase royalty rates, that is an increased cost. Companies are going to bake it in, and they are going to pass it on now. So this whole thing, trying to disassociate these actions with increased energy costs are completely flawed.

Mr. HERRGOTT, supply and demand question because I am not a—I am still apparently at a lower level—

Ms. JAFFE [continuing]. Representative, can I weigh in here? [Inaudible.]

Mr. GRAVES. If you—if you—hang on, Ms. Jaffe. Ms. Jaffe, excuse me. I am trying to ask a question.

So, Mr. HERRGOTT [continuing]. If you decrease supply by pausing through an executive order exploration and production activity, you are decreasing supply but you don't have a corresponding decrease in demand, what happens?

Mr. HERRGOTT. It is going to go up, especially because you don't have a—

Mr. GRAVES. Prices are going to go up. That is right. And that is exactly—the executive order—I am pausing—that is exactly what is going on.

Another question for you, Mr. Herrgott. If something is free, as Mr. Casten noted, do you need to put huge subsidies on it in the form of ITC and PTC, Investment Tax Credit and Production Tax Credit?

Mr. HERRGOTT [continuing]. I am a permitting nerd, not a politician, all right? But I will tell you, you are correct.

Mr. GRAVES. All right. Thanks. I am just trying to understand all this stuff.

So, Mr. Herrgott, the Department of Energy under this administration, or the Biden administration, ran several models looking at the energy future. Every single—and I hope, if anybody listens to anything I say, listen to this.

The Biden Department of Energy just released a report looking at several energy future models. Every single model shows an in-

crease in both domestic and global demand for natural gas. Every single model.

As we have talked about in this committee over and over again, the United States natural gas delivered to Europe and delivered to Asia is anywhere from 41 to 47 percent lower emissions profile. Why in the world would we disincentivize domestic energy production, domestic jobs, domestic economic activity, and yet incentivize Vladimir Putin to do it? I don't understand it for the life of me. I just don't.

Mr. HERRGOTT, so you are a permitting expert, and you have spent a lot of time working on this. Let me ask you a quick question.

If I am doing an environmental project, whether it is a solar array, a wind farm, I am trying to do a wetlands restoration project in the coast of Louisiana, is there a different environmental process—permitting process that if I am trying to go build a road through wetlands?

Is your mic on? Is your mic on?

Mr. HERRGOTT. No. It is the same.

Mr. GRAVES. Okay. So I hope this is something that we can work on, Madam Chair. We have got to tailor the regulatory, the environmental process, to the type of project or perceived threat that is out there.

Mr. Herrgott, if we are talking about financing these projects, what type of threat does the permitting uncertainty pose to the financing?

Mr. HERRGOTT. The debt and equity cost and the default risk, directly associated with the development risk, associated with our failure to solve this, can, in many cases, drive project financing costs up 10 to 25 percent. That is real, and that is on wind and solar projects as we speak, not on natural gas projects because they are highly capital intensive.

There is a direct relationship between failing to address this and the 20 to 30 percent cost that is associated and passed on to rate-payers.

Mr. GRAVES. So back in April, as an example of these delays, back in April, the administration, this administration, identified 22 transmission projects that were ready to go. What do you think—I mean, just knowing the permitting process, how shovel ready are these projects?

Mr. HERRGOTT. Well, one of them completed because we worked on it. The other 21 projects are still 6 years away. So—and that is orphaning any new solar and wind development. We have to have the holistic comprehensive strategy. If we are going to build the wind and solar, we also have to be committed to doing the things we need to build the transmission, and that is just currently not happening.

Mr. GRAVES. Thank you.

Ms. Jaffe, I actually did have a question for you, but I am running out of time, so I am going to submit it for the record. But I do want to ask you about supply and demand of critical minerals and how much sense it makes for us to become more dependent upon critical minerals for China. So I will submit that for the record.

I yield back.

Ms. CASTOR. Next up we will go to Representative Escobar. You are recognized for 5 minutes.

Ms. ESCOBAR. Thank you so much, Madam Chair. And many thanks to our panelists for sharing their expertise with us today. Very grateful to you all.

You know, one of the things that is really concerning to me is the desire that I have heard from some to sort of pump the brakes on a transition that many of us now see as urgent, long overdue, long past its time, and, in fact, in some cases, far too late. So we have to obviously act with the utmost urgency, and we have got to ensure—from my perspective, we have also got to ensure that some of the most vulnerable communities are able to capitalize on what is an almost guaranteed outcome.

I mean, we are going to pass Build Back Better. It is going to happen. And so I think the best use of our time and conversations is to figure out how to best capitalize on that. And my priority is ensuring that economically disadvantaged communities like mine, that have long been neglected by state governments and others, can best capitalize.

How can some of the poorest families, how can some of the poorest communities, really ensure that they are ready for the benefits of Build Back Better? And that includes local governments, local nonprofits, consumers, the private sector.

And so I would love to hear from each one of you how you think vulnerable communities like the one I represent in El Paso, Texas, on the U.S.-Mexico border, can best capitalize and prepare so that we can do the best possible by everyone with Build Back Better.

Ms. Ballentine.

Ms. BALLENTINE. Thank you. This is a really important and beautiful question. And I would like to also recognize that for the members of the Clean Energy Buyers Association, energy is often the second largest controllable operating expense we have for the vast majority of our companies. And our companies employ Americans from every community.

So when we expand organized markets, it lowers costs. When we expand transmission, it lowers costs. And those costs are passed through. Whether you are a retailer or whether you are a pharmaceutical company, they are passed through. Those lower costs are passed through.

And importantly, what we are seeing in communities is these large corporations who have sophisticated energy teams, who are thinking about low-cost, low-pollution, no-pollution clean energy of all types, not just wind and solar but all types of renewables; and how can they work with marginalized communities to say, what if we oversized our project so that we could be the guarantee and get the financing for the project but provide low marginal cost, zero-carbon power to local communities, marginalized communities? How can we do more than have our projects just build jobs? How can we build wealth in communities through our projects?

So I think that is one of the most exciting areas of development, because marginalized communities and companies share a desire for lowering energy costs.

Ms. ESCOBAR. Thank you so much.

Ms. Jaffe.

Ms. JAFFE. Well, I think there are so many things in the bill that would be of assistance. And we have—we have things we need to do because, in the end, globally, those things are going to take place.

China is going to build these products, Europe is going to build these products, and do we want to be importing all of those products from somewhere else or do we want to be having the United States economy be competitive?

And that goes across an entire range of technologies. I mean, we were leading in digital. We have got companies like Google talking about making home thermostats that would allow you to better utilize and smooth out purchases of renewable energy automatically.

There is just so much innovation that is possible to come to market, and it needs the support of the infrastructure that it takes to get that going.

Ms. ESCOBAR. Dr. Varadarajan.

Dr. VARADARAJAN. Well, thank you for the question. I think it is a critical one, because the Build Back Better Act has a number of provisions that make it more financially attractive both for individuals in low-income communities and for investors to make the investments that they would deploy in clean energy resources in vulnerable communities.

Look, this is going to require the communities to know about, and get access to, and have the processes in place to be able to utilize them. And this is going to take a whole-of-government effort. It is going to take civil society, it is going to take local governments, city governments, and state governments to engage to make this happen.

Ms. ESCOBAR. Mr. Herrgott, I will submit in writing because I would love your opinion as well.

Mr. HERRGOTT. I concur with that statement. Wholeheartedly.

Ms. ESCOBAR. Okay. Thank you so much.

Ms. CASTOR. Great. Next, we will go to Representative Palmer. You are recognized for 5 minutes.

Mr. PALMER. Madam Chairman—Mr. Herrgott, the topic of this hearing is “Cleaner, Cheaper Energy: Climate Investments to Help Families and Help Businesses.” Does reducing reliability help families and help businesses?

Mr. HERRGOTT. No, it doesn’t.

Mr. PALMER. Have we experienced in any other part of the country a lack of reliability, particularly with turbines?

Mr. HERRGOTT. Yes. Baseload renewable is still about 6 to 7 years away with the kind of storage and technology, especially with the supply chain issues and the fact that projects that will take 4 or 5 years from now for the lithium, for EVs, beryllium, molybdenum, and several others haven’t even gotten off the ground. So we no longer have the appropriate domestic supply chain for critical minerals.

Mr. PALMER. And from 2011 to 2019, we spent over \$2 trillion on renewables, and they represent about 3 percent of the energy production worldwide, and about 4.5 percent here in the United States.

There was a 2021 report that came out on reliability risk priorities. Do you have any idea what they ranked as the top risk to the reliability of our power grid?

Mr. HERRGOTT. It is probably one of the few studies I haven't read. I would love to learn.

Mr. PALMER. Changing resource mix. Cybersecurity vulnerabilities were number two, but changing resource mix.

So what we are doing right now, as we continue this head-long push toward adoption of renewables, which I think anyone who has much engineering background understands that we are not going to get there in the timeframe they are talking about.

We are putting the reliability of our energy infrastructure at risk. What we just saw in the North Sea when the winds stop blowing, you had that massive spike in natural gas, particularly hit the U.K. hard. It occurred about the same time that Russia decided to reduce their output, supposedly to build their reserves for the winter—which I think was more about sending a message about Nord Stream 2—really did harm to consumers there.

Let me ask you this. Does higher prices help families and businesses, higher—let me ask it in another way.

Does it have the potential to harm families when they can't adequately heat their homes?

Mr. HERRGOTT. Yes.

Mr. PALMER. And we have seen this in the U.K. with the excess winter deaths. We have seen it here in the United States.

Are you aware, Mr. Herrgott, that excess winter deaths kill more residents in Vermont than car crashes?

Mr. HERRGOTT. I was not aware.

Mr. PALMER. It is their own report.

Mr. HERRGOTT. Yeah.

Mr. PALMER. In the winter of 2017–2018 in the U.K., they estimate that there were 17,000 excess winter deaths. Is that acceptable collateral damage for a head long push into renewables?

Mr. HERRGOTT. No.

Mr. PALMER. I didn't think you would agree with that either.

I also want to point out another thing about this. For some reason, we just can't get our arms around the fact that we have got next-gen nuclear that could really pave the way for clean energy for the future. We now have the technology to recycle spent fuel rods. And "spent" is kind of a misrepresentation because they retain about 90 percent of their energy.

Here is the other thing, though. The lifecycle of next-gen, next-generation nuclear, is estimated to be 100 years. Can you imagine where we will be technologically a hundred years from now if we convert to that?

Natural gas, which I think is still a major part of our reducing emissions and providing energy to low-income people and the billion people around the world who don't have access to adequate energy, their life—a lifecycle for a natural gas facility is 60 to 65 years. Do you know what the lifecycle is for solar panels?

Mr. HERRGOTT. They have to be changed every 4 or 5 years and substations accordingly.

Mr. PALMER. And wind turbines is 20 to 30 years. But after about 10 years, they begin to dramatically lose generating power.

And you can't recycle the solar panels. You can't—apparently, right now you can't recycle the wind turbine blades. We are having to bury them.

I just want to point out, when you raise prices, particularly on low-income people, and for all the rhetoric that the Democrats want to have about Build Back Better, it is raising prices.

I keep bringing up to my Democrat colleagues the Pembroke Township in Illinois, about 2,100 people, 85 percent Black. The average income—the median income is about \$16,000 a year. They don't have access to natural gas. They are heating their homes with propane and with wood. And the Reverend Jesse Jackson and Al Sharpton has been trying to get a natural gas pipeline to that city, and they have—they haven't been successful so far.

Let me just add this. It might be actually good news for them because natural gas prices are almost double.

Ms. CASTOR. I am sorry. You have run out of time. Because we have a vote going on, I am sorry, Mr. Palmer, we are having to finish up.

And I will recognize myself for 5 minutes for questions to wrap up here today.

You know, everything that we did in crafting the Build Back Better Act was targeted to lowering costs for American families and businesses across the board. That is why, when you examine Build Back Better, you will see policies relating to energy efficiency, more energy-efficient appliances for consumers, more energy-efficient buildings, electrifying buildings.

Electric vehicles now, you see the electric vehicles and cars and trucks on the road right now, bypassing the gas stations. They are going to be—but we want to make sure they are available for consumers all across the country.

That is why we were totally focused on making sure that consumers really felt it in their pocketbooks, and businesses could save money and pass those cost savings along.

But it is not just the cost of electricity. It is also the cost of climate. Build Back Better also takes us down a road of reducing greenhouse gas pollution that we know impacts our health—so let's build in those costs considerations—the cost considerations of higher property insurance, because of climate fueled disasters, higher flood insurance costs. All of these costs put together are central to the strategy of President Biden and all of us in building back better and lowering costs.

So, Dr. Varadarajan, can you speak to us here, help close us out today on how Build Back Better investments in both clean energy and electrification—we haven't talked a lot about buildings here today—how will that work to help families and businesses lower costs and give them a little relief in their pocketbook?

Dr. VARADARAJAN. Thank you so much again. I appreciate the opportunity to speak to this.

At the end of the day, as we look at the Build Back Better Act, to the provisions that it contains, what it offers, what the majority of the climate action in this bill offers is the opportunity, the power, and the freedom for individuals and utilities and businesses across the country to make the choice, if it is economically sensible to them, to choose lower, cheaper, and cleaner energy.



This is true when it comes to utilities making choices about the resources they want to put on their system. At the end of the day, every single utility in this country is responsible for providing affordable power to its consumers that is reliable.

If a utility chooses to use the powers within this Act that give it—make it more attractive for them to build great resources like storage, like transmission, to ensure greater reliability for their customers, they can do that. If their regulators agree or if their communities agree, with the input from these key stakeholders, they can make choices they didn't have before, to deliver cheaper and more reliable power to their customers.

But it is not just that—and this is a really important point—every individual in the country, every household in the country, businesses in the country, can also, because of additional provisions in this Act that make it easier for individuals to make efficiency improvements, to choose electrified appliances, to make upgrades to their buildings. They can make those choices themselves and take it upon themselves to make themselves more energy-independent. And they can do this in their homes by building clean energy resources like solar, by reducing—by switching to induction ovens that, you know, avoid significant harm from NO<sub>x</sub> and SO<sub>x</sub> pollution that cause asthma to their children.

These are the types of choices that are available as a result of this Act that can ultimately make it possible for each individual company and cities and States across the country to make the choice to move to cleaner energy in a way that reduces their risks and reduces their cost.

This is the power of the Act. And I think, you know, again, when we look at the possibility for cost reductions across the economy, the Build Back Better Act is going to more than pay for itself ultimately in the reduced costs of climate harm and in the reduced cost—health costs associated with reduced pollution within the homes and, more broadly, across our economy, and in reduced costs to consumers.

And so I think it is an enormous opportunity. I am looking forward to action by all of Congress and by the President to put this into action moving forward.

Ms. CASTOR. Well, thank you very much. Yes, we are looking forward to action. We passed it here in the House. It is pending in the Senate. Build Back Better means cleaner, less expensive energy for consumers and businesses across America.

So I would like to thank our witnesses for their testimony today.

And, without objection, I will enter into the record, first, a December 2021 letter from the Solar Energy Industries Association, outlining the steps the solar industry has taken to ensure forced labor is not used in the supply chain, and their recommendations for growing U.S. solar manufacturing; two, a report released today by Rewiring America, titled, Energy Bill Security for American Households Through Electrification, which shows how American households with efficient heat pumps and electric vehicles will see lower heating and driving costs this winter compared to homes with fossil heating and traditional vehicles; three, an October 2021 analysis by Resources for the Future, that shows clean energy tax credits included in the Build Back Better Act can achieve 69 per-

cent clean power generation by 2030, while lowering costs for rate-payers by 3 percent; and four, a December 2021 analysis by Resources for the Future and the Clean Energy Buyers Institute, that shows building a transmission macro grid would add an estimated \$5 to \$10 billion in annual net benefits and would reduce national average retail electric rates by approximately 1 to 2 percent.

[The information follows:]

**Submissions for the Record**  
**Representative Kathy Castor**  
**Select Committee on the Climate Crisis**

**December 9, 2021**

December 8, 2021

Chair Kathy Castor  
 U.S. House of Representatives Select  
 Committee on the Climate Crisis  
 H2-359 Ford Building  
 Washington, DC 20515

Ranking Member Garrett Graves  
 U.S. House of Representatives Select  
 Committee on the Climate Crisis  
 H2-359 Ford Building  
 Washington, DC 20515

Dear Congresswoman Castor and Congressman Graves:

I appreciate the opportunity to share with you the steps the Solar Energy Industries Association (SEIA) and our members have taken to prevent the use of forced labor in the solar supply chain and reduce our reliance on solar imports by growing U.S. solar manufacturing.

SEIA, on behalf of the more than 231,000 American workers employed by the domestic solar industry, is committed to ensuring that no products made from forced labor should enter the United States and we support efforts to address forced labor in China's Xinjiang Uyghur Autonomous Region (Xinjiang).

SEIA has been calling on the industry to relocate supply chains<sup>1</sup> from Xinjiang since October 2020. On December 8, 2020, International Human Rights Day, SEIA announced the Solar Industry Forced Labor Prevention Pledge<sup>2</sup> and restated our recommendation to industry participants to move their supply chains. Since then, 300 companies representing the majority of solar panels sold in the U.S. market have signed the pledge.

In addition, SEIA has updated its Solar Industry Commitment to Environmental & Social Responsibility<sup>3</sup> to ensure the industry is adequately and proactively addressing evolving environmental and social responsibility issues. SEIA also partnered with leading experts in solar supply chain transparency to establish a comprehensive Traceability Protocol.<sup>4</sup> The protocol will serve as an important compliance tool and give solar companies the ability to accurately determine the source of key components in a solar panel.

Leading solar panel suppliers are already taking steps to ensure the traceability of key inputs. Among those steps is to ensure that suppliers are relocated in regions where companies can conduct independent third-party audits.

As this issue highlights, there are significant policy benefits associated with increasing domestic supply of solar products. Though some critical solar components are already made in the United States, bolstering our domestic manufacturing capacity throughout the entirety of the solar value chain would help promote transparency, reduce the need to rely on imported products and create good-paying jobs here at home.

Indeed, SEIA is leading the way to an American solar manufacturing future. In May 2019, SEIA modified its bylaws to create a new Manufacturing Division and

<sup>1</sup> <https://www.bnnbloomberg.ca/u-s-solar-group-calls-for-pulling-out-of-xinjiang-over-abuses-1.1511887>

<sup>2</sup> <https://www.seia.org/sites/default/files/Solar%20Industry%20Forced%20Labor%20Prevention%20Pledge%20Signatories.pdf>

<sup>3</sup> <https://www.seia.org/research-resources/solar-industry-commitment-environmental-social-responsibility>

<sup>4</sup> <https://www.seia.org/sites/default/files/2021-04/SEIA-Supply-Chain-Traceability-Protocol-v1.0-April2021.pdf>

Board of Directors seat dedicated to representing domestic solar manufacturing interests. Later that year, SEIA hosted a Solar+Manufacturing Summit<sup>5</sup> attended by nearly 100 solar leaders from across the nation. This summit served as the basis for SEIA's September 2020 Manufacturing White Paper,<sup>6</sup> which set a goal of 100GW of domestic solar and storage manufacturing capacity by 2030.

As first articulated in SEIA's Manufacturing White Paper, our country needs a new approach to growing U.S. solar manufacturing. As we have said for many years, and as has been validated time and again, tariffs are ineffective at growing solar manufacturing capacity. What our industry requires is a suite of long-term federal investments, including:

- 1. Demand drivers such as a long-term extension of the solar investment tax credit with direct pay and related bonus credits for meeting certain domestic content thresholds;
- 2. Ongoing domestic production support, i.e., the Solar Energy Manufacturing for America Act (SEMAA), as our manufacturers and their suppliers scale operations in a hyper-competitive global environment; and
- 3. Incentives for private sector investments in manufacturing capacity, i.e., a refundable 48C manufacturing tax credit.

Importantly, all three categories of federal investments are required if we hope to truly compete as a nation in solar manufacturing. We need to recognize that the United States is competing for private sector investments against not only China but other countries as well. Importantly, as we grow our domestic solar manufacturing base here at home, we must also recognize that it will take time to scale operations and reduce our reliance on imports.

SEIA is committed to preventing forced labor in the solar supply chain, and we would appreciate the opportunity to lend our expertise and work constructively with both Congress and the Administration to uphold U.S. law and prevent the importation of products made with forced labor.

We are eager to meet with you and members of your respective staffs to discuss our efforts to stamp out forced labor. That work will ensure a vibrant and safe global supply chain, which will be critical as we scale up a domestic manufacturing base. We also would like to discuss specific policies to support strong U.S. manufacturing and the massive demand for solar in the U.S. that will be needed to expand domestic supply chains, create jobs and fuel economic growth.

Sincerely,  
Abigail Ross Hopper  
President & CEO

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ATTACHMENT: Caslisch, S., Grace, R., Daly, G., and Matusiak, A. Rewiring America (2021 December), *Energy Bill Security for American Households through Electrification*.

This report is retained in the committee files and available at:  
<https://www.rewiringamerica.org/policy/energy-bill-security>

ATTACHMENT: Roy, N., Burtraw, D., and Rennert, K. Resources for the Future (2021 October), *Cost Analysis and Emissions Projections under Power Sector Proposals in Reconciliation*.

The brief is retained in the committee files and available at:  
<https://www.rff.org/publications/issue-briefs/cost-analysis-and-emissions-projections-under-power-sector-proposals-in-reconciliation/>

ATTACHMENT: Shawhan, D., Witkin, S., et al. Resources for the Future and the REBA Institute (2021 December), *Evaluation of Power Sector Emissions Reduction Pathways*.

The brief is retained in the committee files and available at:  
<https://media.rff.org/documents/Evaluation-of-Power-Sector-Emissions-Reduction-Pathways-Summary-for-Policymakers.pdf>

<sup>5</sup> <https://www.seia.org/events/solar-manufacturing-summit>

<sup>6</sup> [https://www.seia.org/sites/default/files/2020-09/SEIA-American-Manufacturing-Vision-2020\\_FINAL.pdf](https://www.seia.org/sites/default/files/2020-09/SEIA-American-Manufacturing-Vision-2020_FINAL.pdf)

Ms. Castor. Without objection, all members will have 10 business days within which to submit additional written questions. For the witnesses, I ask our witnesses to respond promptly. And thank you again for joining us at this hearing.

The meeting is adjourned.

[Whereupon, at 3:11 p.m., the committee was adjourned.]

[The information follows:]

**United States House of Representatives  
Select Committee on the Climate Crisis  
Hearing on December 9, 2021  
“Cleaner, Cheaper Energy:  
Climate Investments to Help Families and Businesses”**

**Questions for the Record**

**The Hon. Miranda A.A. Ballentine  
Chief Executive Officer  
Clean Energy Buyers Association  
Clean Energy Buyers Institute**

THE HONORABLE KATHY CASTOR

**1. Ms. Ballentine, how would lowering the cost of clean energy help companies achieve their climate and clean energy goals?**

The Clean Energy Buyers Association’s (CEBA) research arm, the Clean Energy Buyers Institute (CEBI), in partnership with the Resources for the Future (RFF) and the National Renewable Energy Laboratory (NREL) conducted a study of the most effective ways to decarbonize the electricity system.<sup>1</sup> The study found that expanding wholesale markets and supporting significant transmission expansion are one of the most effective and cost-efficient approaches. Organized wholesale markets expanded to the West and SE could save consumers additional \$11 billion per year and a national transmission macrogrid could reduce retail bills a further roughly 2%.<sup>ii</sup> If pursued in combination with a national Clean Energy Standard, the study also found that these measures could result in close to \$100 billion in net annual benefits by 2035. A copy of the report is included with this response.

Companies are committed to addressing the climate crisis by setting clean energy goals and significantly contributing to clean energy deployment, as evidenced by the 43 GW of clean energy transacted to date. Continuing to drive down the cost of clean energy, along with increasing access to clean energy, will accelerate their ability to decarbonize their operations and their supply chains. Companies lack sufficient market options to directly control their clean energy procurement options, and where markets do exist, capacity constraints, due to lack of adequate infrastructure, causes congestion, which increases prices, and often limits their ability to procure the clean energy they want. Hence, why expanding wholesale markets and transmission is critical to enabling customers to help drive the clean energy transition.

**2. Ms. Ballentine, you mentioned companies passing on energy costs and savings to customers. Can you tell us other ways companies have dealt with volatile fossil fuel prices?**

For many institutions, energy is one of the top controllable operating expenses, often second only to labor costs. Fossil fuel price volatility and future price uncertainty can wreak havoc on even the best business plan.

Most businesses do everything they can \*not\* to pass on volatile commodity costs to customers, and they first seek ways to mitigate the volatility.

<sup>1</sup> Clean Energy Buyers Institute (formerly Renewable Energy Buyers Institute) and Resources for the Future. July 2021. Evaluation of Power Sector Emissions Reduction Pathways. <https://media.rff.org/documents/Evaluation-of-Power-Sector-Emissions-Reduction-Pathways-Summary-for-Policymakers.pdf>

<sup>2</sup> Clean Energy Buyers Institute (formerly Renewable Energy Buyers Institute) and Resources for the Future. July 2021. Evaluation of Power Sector Emissions Reduction Pathways. <https://media.rff.org/documents/Evaluation-of-Power-Sector-Emissions-Reduction-Pathways-Summary-for-Policymakers.pdf>

One way to mitigate rising electricity prices is for companies to enter into long term power purchase agreements (PPA) for zero-marginal cost renewable energy, and they are doing exactly that. Corporate PPA's announced in 2020—over 10.2GW—were equivalent to over 40% of all new zero-carbon capacity added that year.

Likewise, before passing through costs to customers, most companies would see other paths to lower costs. For example, when electricity prices increase, the ROI on energy efficiency projects improve.

**3. Ms. Ballentine, can you speak further to the question of what kinds of technologies could help achieve a zero-carbon energy system?**

A combination of zero-carbon generation technologies, plus enhanced transmission, plus storage for intermittent zero-carbon generation, plus potentially carbon capture on emitting generation sources, plus smarter demand response, plus energy efficiency are likely to be required to fully decarbonize the grid.

CEBA supports the Build Back Better Act's investment of \$30 billion to the Department of Energy for clean technology development and deployment.

There is fascinating research being conducted at the Department of Energy's national labs on electric power generation from green hydrogen, next generation and smaller scale nuclear, tidal power, and biomass gasification. If these innovative technologies meet the criteria of a zero-carbon energy system, CEBA welcomes the addition of a more diverse clean energy mix. CEBA is technology neutral and defers to our members to determine their application and use as several factors will warrant one region's or one company's use of certain technologies versus another region or company.

As more attention and investments are directed toward modernizing the electric grid, however, we can anticipate further technological advances that will improve the transmission efficiency and operations. Dr. Uday Varadarajan mentioned some of the advancements in technology that have the potential to reduce transmission power loss, improve efficiencies, and lower operating costs during his testimony on December 9, 2021, in front of the House Select Committee on the Climate Crisis.

**4. Ms. Ballentine, in your testimony, you spoke about some of the transmission investments in the Build Back Better Act and the Infrastructure Investment and Jobs Act. How would moving towards a more nationally-connected grid, a MacroGrid, help your companies achieve their clean energy and climate goals?**

A macrogrid could help CEBA's member companies achieve their clean energy and climate goals as it would provide a backbone electrical system with significant capacity options to procure clean energy. More significantly, the presence of a macrogrid, while important to my membership, is a hardening of the electrical grid that would provide substantial reliability benefits especially in extreme weather events, which are regular occurrences. The macrogrid provides resiliency to the system by utilizing neighboring electric supply options and mitigating system outages.

In addition, modeling by Resources for the Future shows that the clean energy tax credits in the House-passed Build Back Better Act alone could incentivize up to 69% carbon-free electricity by 2030.<sup>iii</sup> The House-passed Build Back Better Act's \$180 billion in clean energy tax incentives will generate billions in additional private sector investment in a broad spectrum of clean energy technologies from more investments in renewables, advanced nuclear, carbon capture and sequestration to clean hydrogen. These additional investments will lower emissions from electric generators, reduce technology deployment costs, break ground on new construction projects creating thousands of new jobs across the clean energy supply chain, and as further progress becomes apparent, catalyze more investment in emerging technologies.

When these tax incentives are complemented with transmission capacity investments now available through the Infrastructure Investment Jobs Act, and the potential expansion of organized wholesale electricity markets, which is already under consideration in several regions, we will have the tools, the technology, and the resources to decarbonize the electric grid. We will also enable the private sector to fulfill its commitments to meet fully their clean energy and decarbonization objectives.

<sup>iii</sup>Roy, N., Burtraw, D., and Rennert, K. 7 October 2021. *Cost Analysis and Emissions Projections under Power Sector Proposals in Reconciliation*. Resources for the Future. <https://www.rff.org/publications/issue-briefs/cost-analysis-and-emissions-projections-under-power-sector-proposals-in-reconciliation/>

**5. President Biden just announced a new Executive Order on sustainable procurement, which is a great step forward for creating jobs and reducing carbon pollution. Using the Federal government's procurement power for clean vehicles, clean fuels, and innovative building technologies will help bring new solutions to market so all American can experience the benefits of lower-cost, zero-emission climate solutions. How would 24/7 clean electricity help expand clean energy deployment in communities across the country?**

CEBA applauds federal efforts to achieve 100% carbon-free electricity by 2030 as directed in Executive Order (EO) 14057. The order provides the ambition and scale needed to use the full procurement and purchasing power of the federal government and 24/7 carbon-free pollution electricity standard sends a strong market signal that time and location-matched clean energy is imperative to accelerating decarbonization.

Through power purchase agreements and other tools, energy customers have facilitated the deployment of more than 44 gigawatts (GWs) of renewable energy since 2008, which is over a quarter of all wind and solar capacity in the United States. Voluntary energy customers contracted for 10.6 GW of clean energy in 2020—the equivalent of 40% of all new carbon-free capacity installed. Last year through the end of the third quarter, voluntary energy customers contracted approximately 7.88 GW of new off site, utility scale renewables—equivalent to 34% of the new generating capacity added (or planned to be added) to the grid.

To fully decarbonize the electric grid, however, we must consider the decarbonization impact of energy procurement options more intentionally. Energy customers' ambitions have evolved beyond the traditional annual matching of clean energy with an invested interest in matching consumption with carbon-free energy on a local, temporal, and demand-driven basis.

Advancing the suite of next-generation procurement strategies will require a coalition of stakeholders collaborating on the market, technology, and data solutions. CEBA looks forward to working alongside the committee and other lawmakers to overcome the barriers that presently exist and implementing solutions to accelerate progress towards decarbonizing the grid.

**6. Ms. Ballentine, your members have ambitious clean energy and climate goals, and in many cases have partnered with cities on meeting those targets. How are your members addressing the situation in states where the state leadership is preventing cities from moving forward? Could you tell us more about your state-level initiatives?**

As I noted in my testimony, the lack of organized wholesale markets and transmission bottlenecks are the largest obstacles to carbon-free electricity. Expanding organized wholesale markets to every region of the country and expanding transmission capacity would not only decarbonize the grid but could also save energy customers \$11 billion annually.

While CEBA is focused on advancing policies in the halls of Congress and before the Federal Energy Regulatory Commission to modernize the electric system, CEBA also works collaboratively with the business community and others at the local and regional level to grow support from the ground up for competitive organized wholesale markets. This work is being done both at the Clean Energy Buyers Institute where we are conducting research and developing educational material to inform regional, state, and local officials on the benefits of organized wholesale markets and other related issues, as well as at CEBA where we engage interested parties in policy development at the state and regional level.

### Questions for the Record

**Dr. Uday Varadarajan**  
Principal, RMI; and  
Precourt Energy Scholar,  
Sustainable Finance Initiative at Stanford University

THE HONORABLE KATHY CASTOR

**1. Dr. Varadarajan, how would the Build Back Better Act help utilities and communities choose clean power generation strategies that work for them?**

The proposed Build Back Better Act (BBBA) offers a suite of incentives to make it much less expensive for utilities and communities to make the choice to shift to clean power—using the technologies and strategies that work best for them while maintaining or improving reliability. Most important among these are provisions that make clean energy tax credits more readily useable by utilities and communities to reduce the cost to customers of employing a broader range of clean technologies and strategies.

In more detail, compared to existing tax credits, the BBBA credits are more easily monetized, longer in duration, and treat competing clean technologies more equitably. As a result, the credits will be more flexible in application, expanding the ranks of eligible entities, increasing the timeframe for their use, and empowering customers and communities to select climate-sustaining solutions that are also tailored to local circumstances. This flexibility should boost grassroots engagement in furtherance of a clean future and also help deliver a better return on fiscal investment for taxpayers.<sup>1</sup>

The improved BBBA tax credits:

- **Reward Performance:** BBBA newly provides solar asset owners with the option to claim the production tax credit (PTC) that has fueled the growth of the wind industry over the past two decades—and which wind developers have generally chosen in favor of the investment tax credit (ITC) currently available to both technologies. With BBBA, solar and wind will be eligible under the existing PTC through 2026, after which time a new Clean Energy Production Tax Credit (45BB) will kick in.

Unlike the ITC, which is claimed all at once when a project is placed in service and is typically calculated on the basis of a “fair market value” open to dispute, the PTC rewards output, providing a credit for each unit of energy generated over the first decade of operations. As such, the interests of solar asset owners, taxpayers, climate advocates, and ratepayers are aligned in favor of cost transparency and demonstrated decarbonization performance.

- **Enable Fair Competition:** the PTC is not subject to “tax normalization.” Normalization is a legal restriction within the tax code that compels regulated investor-owned utilities (IOUs) to keep a portion of benefits of the ITC for investors, the argument being that investors must benefit from an “investment” credit. Customers are allowed only to receive a fraction of the financial value of the credit attenuated over the long operating life of their solar assets. In contrast, unregulated entities—such as renewable developers—are free to pass on the benefits of the ITC to their customers as dictated by market competition, a more economically rational way to balance the interests of investors and consumers. Put simply, because unregulated developers are not subject to normalization restrictions, they can sell electricity at lower prices than IOUs, even when technology and capital costs are the same. (However, by hindering full and fair competition, normalization likely allows third-party developers to demand higher prices for solar than would be the case without the constraint. For a commodity product like solar generation today, such a barrier to competition has no compelling justification.)

The normalization disadvantage has created a conflict between the business interests of IOUs—which sell electricity to nearly 50 million households and 7 million business accounts in 49 states—and solar deployment. Utility opposition can be explained by how regulated IOUs make investment decisions and earn profits. Before an IOU builds a power plant, it must prove to its regulator that the investment is prudent. Prudence considers cost relative to other ownership options. Third-party solar power purchase agreements are unattractive for IOUs, which earn profits for

their shareholders by investing in and owning assets. IOUs therefore lack the financial motivation to accelerate solar deployment. In this context, an IOU's financial interests are likely best served by resisting the transition to solar.

The PTC option will provide a route around the normalization barrier and accelerate progress toward America's climate goals. Indeed, according to modeling from the Rhodium Group, allowing renewables to choose between the ITC and PTC would double emissions reductions by 2031 compared with a straight 10-year extension of the current tax credits.<sup>ii</sup>

- **Improve Policy Efficiency:** BBBA provides for direct pay of tax credits. Most clean energy developers and utilities do not have the tax liabilities necessary to claim tax credits at their full present value. The prevailing solution has been to negotiate complicated tax equity workarounds—which reduce the value of the tax credits passed down to consumers. Changing these tax credits to permit direct pay would enable developers to realize the credit's whole value, further lowering the cost of clean energy. The change would also open up the credits to investors currently excluded from direct access to tax credits, such as not-for-profit and governmental entities.

Under existing law, companies monetize a cash benefit from the ITC and PTC only if they can offset taxes due in that year. Otherwise, the credits must be “carried forward” for possible future use. RMI analysis of financial disclosures shows that in 2019 IOUs had aggregate tax liability sufficient to build less than 4 GW of new solar and storage per year—roughly enough capacity to replace just one or two coal plants.<sup>iii</sup> Over the last two decades, policymakers have put in place “bonus depreciation” provisions to incentivize investment to fight recessions. These provisions allowed companies to immediately deduct as an expense from their pre-tax income very large share—or, in some cases, even all—of the investment they make in new capital assets. Utilities therefore often do not owe enough in taxes to see a current cash benefit from the existing ITC and PTC. Depending on state regulatory practices, this inability to monetize can result in a financial burden—a carrying cost—for customers or shareholders.<sup>iv</sup>

A utility can currently opt to purchase clean power from a third-party developer or partner with tax equity investors—large financial institutions that have found a market selling their tax liabilities to developers—to realize the benefits from tax incentives for their customers. However, the use of tax equity often comes with higher financing costs that reduce the amount of tax incentive benefits that can be passed on to customers. And, as noted in connection with the normalization issue, reliance on third-party capital is at odds with the core of the utility business model, which is to deploy utility shareholder capital.

Public power agencies and many cooperative utilities will also benefit from direct pay. As not-for-profit entities, these utilities do not currently have direct access to clean energy tax credits. Instead, they must rely on private-sector developers and investors as intermediaries. But these private entities have capital costs well above the low-cost debt that not-for-profits and governments can access for their fossil investments.

While IOUs, public power agencies, and cooperatives owned around 55% of total generating capacity in the US in 2019, their corresponding shares of wind and solar were only 15% and 11%, respectively. Direct pay can significantly improve the ability of these entities—currently responsible for 80% of the emissions from coal in the power sector—to deliver cost savings from transitioning to carbon-free electricity.

- **Incentivize Critical Reliability-Boosting Technologies:** BBBA allows stand-alone battery storage and transmission to qualify for the up to a 30% ITC with direct pay. Both storage and transmission are critical for allowing the grid to absorb a higher penetration of variable clean energy while also allowing a much larger and diverse group of communities (e.g., along transmission routes and in areas where storage is valuable even without collocated generation) to benefit from clean energy tax incentives.
- **Extend the Duration of Availability of Credits:** The new BBBA credits—the 45BB PTC for wind and solar and the 48F ITC for wind and solar and stand-alone storage—will be available in full through the earlier of 2031 or when the US electric sector achieves a 75% emissions reduction from 2021, while the ITC for transmission is set to be available through 2026. These are longer horizons than have been available for clean energy for much of the last decade, which has seen the PTC and ITC repeatedly face phase-outs and phase-downs that have been relieved by short-term (often 1-year) extensions. The BBBA approach will increase investor confidence, counter “fear of missing out”



decision making, and mitigate logistical and construction bottlenecks that have been exacerbated by previous phase-out and phase-down deadlines.

In sum, BBBA provides far more flexible incentives for clean energy, with new and expanded tax credits that

- utilities and customers can choose to claim (or not claim) depending on their needs and preferences;
- enable communities to act on their own, by directly accessing tax credits through public power entities as well as via individual investments in technologies such as stand-alone storage that invite modular deployment,
- achieve technology-neutrality with regard to wind and solar, and
- sustain existing nuclear plants and also incentivize hydrogen technologies and carbon capture and storage, giving utilities and communities more options for clean power tailored to local conditions. As variable renewable energy penetration increases, such “firm” resources can help maintain grid stability.

**2. In your view, how will the Infrastructure Investment and Jobs Act promote electric grid reliability and how would the Build Back Better Act build on that foundation?**

The Infrastructure Investment and Jobs Act (IIJA) provides billions of dollars to reduce the grid impact of extreme weather events that are increasing in frequency as a result of climate change, including \$5 billion for grid resilience and reliability upgrades and \$3 billion for smart grid technologies.<sup>v</sup>

IIJA also includes incentives to build out transmission and distribution lines and gives meaningful authority to help federal agencies navigate land use disputes that often delay grid improvements. Grid expansion that keeps pace with renewable deployments is critical for future grid reliability.<sup>vi</sup>

BBBA will build upon IIJA by adding and expanding tax credits for firm clean resources, transmission, and battery storage systems. RMI further recommends the inclusion of an ITC tax normalization opt-out for transmission and stand-alone storage to allow utilities to fully pass on these benefits to customers. Even if third-party ownership of such assets is less established than is the case with solar generation, the potential for normalization to misalign utility interests and clean energy policy goals (while also increasing customer costs) is nevertheless without compelling justification.

**3. RMI’s analysis showed that states all across the country can benefit from the clean energy tax credits included in the Build Back Better Act. Could you please explain how consumers in states such as Indiana or Ohio can benefit from these clean energy tax credits even if the renewable resources in their states are not quite as abundant as those in other regions of the country? Specifically, if states like Indiana and Ohio build relatively less new clean energy generation within their boundaries, what would make it possible for their residents to experience some of the economic benefits?**

Even in states like Indiana and Ohio that cannot match the insolation of the Southwest or the wind energy of the Great Plains, clean resources are often already economic to build. In Indiana, for instance, the Northern Indiana Service Company plans to retire its entire coal fleet by 2028 and replace them with cheap renewables, which will reduce carbon emissions by 90%, save customers \$4 billion, and promote local jobs and economic development.<sup>vii</sup>

With BBBA, clean energy economics will improve across the country. Individual investment decisions will still need to assess resource quality, proximity to load, and the value of geographic diversification in regional power systems. New clean energy technologies, such as offshore wind on the Great Lakes, or hydrogen plants with CCS and nuclear small modular reactors (SMRs) on former coal plant sites, may also play a role in anchoring new investment in Midwestern states, thanks in no small part to the BBBA’s more expansive tax credits.

Because of Indiana and Ohio’s current high reliance on expensive coal and low renewable penetrations (9% in Indiana and 3% in Ohio),<sup>viii</sup> consumer savings from BBBA’s clean energy provision will be very large, even if net reductions in in-state shares of generation occur. In fact, RMI’s analysis found that BBBA tax credits would deliver larger ratepayer savings to Indiana than any other state, *over \$800 million per year* by 2030. Ohio could see over \$100 million in savings annually by 2030.<sup>ix</sup>

**4. Fossil energy production requires extraction that has transformed huge swaths of the American landscape and oceans. How do solar and wind energy compare in terms of their use and impact on US lands and waterways to deliver similar energy services?**

A 2013 NREL study shows that if powered on solar power alone, the United States would need about 22,000 square miles of solar panels—about the size of Lake Michigan—to *generate the entire country's electricity*.<sup>x</sup> A similar analysis to generate the entire country's electricity from wind turbines showed that they only needed about 1,200 square miles of wind turbines, or about the size of Rhode Island.<sup>xi</sup> These equate to approximately 0.7% and 0.03% of the total land area in the continental United States. And a new analysis by Lawrence Berkeley National Lab has found that older estimates of solar density are out of date, with solar panel density increasing by over 50% from 2011-2019, and energy generation increasing by over 25% over that same time period.<sup>xii</sup>

Critics of renewables often point to these estimates and then suggest that fossil fuel generation—which occurs at centralized power plant facilities that occupy a much smaller footprint—have a much smaller impact on the landscape. But a fair comparison must take into account land used for upstream processes like fuel storage, refinement, and transportation, and, much more importantly, the ongoing annual need for *additional land every year* for fuel extraction, such as mining and drilling, just to maintain existing consumption.

With this wider frame, the land intensity of renewables compares very favorably with fossil energy.

For example, analysis of U.S. data shows that 1.8 million Gigawatt-hours (GWh) of electricity from were generated from coal in 2009, which required disturbing over 117,000 acres in additional land in the process. This means that each additional acre of new land disturbed by coal mining ultimately generated 15 GWh of electricity in 2009.<sup>xiii</sup> Fossil gas produced in new wells using hydraulic fracturing in dry shale or tight gas formations generally generate a total of between 20–50 GWh of electricity over the life of the well per acre of land disturbed, primarily within the first five years of drilling.<sup>xiv</sup>

However, unlike coal or gas generation which will need to disturb additional lands every year just to maintain production levels, solar and wind installations can continue generating electricity on the land they occupy indefinitely. Assuming (conservatively) a capacity factor of 25.7% and 0.5 acres of land per 3-megawatt wind turbine, a 3-megawatt wind turbine produces approximately 13 GWh per acre each year. However, over a 30-year asset life, a single 3-megawatt wind turbine can generate 200 GWh while significantly disturbing just a half-acre of land.<sup>xv</sup> Fixed-tilt solar installations in the US, on the other hand, would appear to be much less land-efficient at first glance, as an acre of land produces on average 0.4 GWh of electricity per year.<sup>xvi</sup> But that facility can generate 12 GWh over 30 years without the need for additional land. Moreover, unlike coal mines, solar facilities can also be located on rooftops or other lands that are primarily used for other purposes. This means that our estimate likely overestimates the new land that needs to be disturbed to generate electricity from solar PV.

And, of course, acreage devoted to wind and solar can continue to produce through successive asset generations, in theory boosting the efficiency of land use in perpetuity. Note that we must be careful to account for the additional land used for mineral extraction globally to construct successive generations of solar and wind farms as well. However, as we discuss below, these challenges can be overcome by following best practices for recycling and reuse. All in all, the renewable nature of these resources indeed implies that in the long run they are likely to be far more land-efficient compared to coal or fossil gas resources.

**5. Could you please explain how building electrification would benefit low-income households? How would it protect them from indoor air pollution? How would it reduce energy costs?**

This winter Americans will see home energy bills increase significantly, in large part due to spiking natural gas costs.<sup>xvii</sup> The burden will weigh most heavily on the 4.8 million households already facing energy insecurity.<sup>xviii</sup> Fortunately, electrification of household heating and cooking, *when combined with a switch to renewable resources that rely on free fuel from the sun and wind*, will help insulate low-income households from energy price volatility.

Electrification will also reduce air pollution from burning gas, wood, and biomass, practices that contribute to more negative health effects than burning coal in many states.<sup>xix</sup> Household combustion is the main reason that the indoor environment is

often more polluted than the outdoors.<sup>xx</sup> In low-income communities where respiratory diseases are prevalent, building electrification will have an outsized beneficial impact on health outcomes.

While new all-electric, single-family homes are now less expensive to build and operate than new traditional mixed-fuel homes,<sup>xxi</sup> the BBBA adds a suite of incentives to help retrofit older buildings, particularly those occupied by low-income households. Particularly noteworthy are the High Efficiency Electric Home Rebates, two-thirds of which must be directed to low-income and tribal communities, and the Home Energy Performance-Based Whole-House Rebates and Training Grants.

**6. Like all technologies, clean energy technologies can lose efficiency or wear out over time. However, clean energy technologies typically have long productive lifespans. The National Renewable Energy Laboratory estimates solar panels maintain productivity for at least 20–25 years, and electric vehicles batteries are commonly warrantied for 8–10 years, with NREL data showing batteries can last well beyond that timeframe. When clean energy technologies do have to be retired, what opportunities do we have in the United States to reuse and recycle critical materials used in the production of clean energy technologies such as solar panels and EV batteries?**

Based on RMI review of regulatory filings, including numerous integrated resource plans (IRPs), the anticipated depreciable life of utility-scale solar (and wind) assets is typically 30 years or longer. This greater asset utilization (compared with the NREL assumption of 20–25 years) implies significantly reduced recycling needs.

When retirement and recycling is necessary, solar panels are about 80% glass and aluminum by weight, both materials which already have extensive recycling supply chains.<sup>xxii</sup> Copper and silver are also significant inputs and can be readily recovered and reused.

Recycling pathways for wind are admittedly more complicated. Turbines are made primarily of either glass or carbon fiber blended with epoxy resin, which makes separating the materials difficult for recycling. However, innovative processes have been developed to recycle current wind turbine materials, such as a recent announcement by GE to recycle wind turbines for cement production, as well as new technologies under development that would make recycling future wind turbines much easier.<sup>xxiii</sup> And wind manufacturers are stepping up their commitments to eliminate turbine waste and shift to recycling.

Electric vehicle batteries primarily use lithium-ion battery packs. Although the recycling industry here is currently in an early stage, it is beginning to scale,<sup>xxiv</sup> driven by projected payback periods of under one year for demonstration scale plants (ca. 1,000 tons per year)<sup>xxv</sup> and an expected global annual EV battery recycling need of nearly 400,000 tons by 2025.

As innovation progresses, technologies improve, and demand increases, recycling costs will fall and recycling production will rise. A similar process happened with the current lead-acid battery, used in current gasoline-powered cars, where a recycling industry scaled up as those batteries became dominant, and we now recycle 98% of lead-acid batteries.<sup>xxvi</sup>

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### Questions for the Record

Amy Myers Jaffe  
 Research Professor and Managing Director,  
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 The Fletcher School at Tufts University

THE HONORABLE KATHY CASTOR

#### 1. Ms. Jaffe, the Build Back Better Act makes it cheaper for Americans' next car to be an electric vehicle. More EVs on the road will reduce demand for oil. How would reducing demand for oil protect U.S. national security interests?

For the last five decades, the world has experienced economic swings and geopolitical conflicts centered around the oil and gas commodity price cycle. In multiple periods historically dating back to the 1970s but including more recently, 2006–2009 and 2012–2015, rising global economic growth has been accompanied by a sharp rise in the price of oil, which in turn, created discontinuities and financial crises that have jeopardized U.S. national interests, economic health, and the well-being of lower income Americans. On all three fronts—energy markets, financial markets, and energy geopolitics—the geopolitical and economic outcomes of wild energy market oscillations have become intolerably high. We have seen multiple global financial meltdowns accompanied by rising social and economic inequity. The investment cycle in energy production capacity has tended towards a pro-cyclical pattern, contributing to greater volatility that intersects with geopolitical risk in increasingly cataclysmic ways. In 2008, oil prices hit \$147 a barrel and U.S. economic growth fell precipitously. Over 3.6 million American jobs were lost between December 2007 and January 2009.

Attenuating the cycle in global oil demand by decoupling oil use from economic growth is the best way to prevent this kind of repeating crises from occurring over and over again. Multiple studies have shown that countries with lower energy consumption to GDP ratios experience less inflation-induced GDP losses. Reducing the oil intensity of the U.S. transport sector protects both individual consumers and the overall economy.<sup>1</sup> Achieving fuel diversity by adding more EVs to the U.S. transport sector is one major way to reduce the oil intensity of the U.S. economy and thereby

<sup>1</sup> Mahmoud El-Gamal and Amy Myers Jaffe, *Oil, Dollars, Debt, and Crises*, Cambridge University Press, 2010

insulate the U.S. economy from sudden, adverse oil price shocks and geopolitical leverage. Energy efficiency standards is another way.

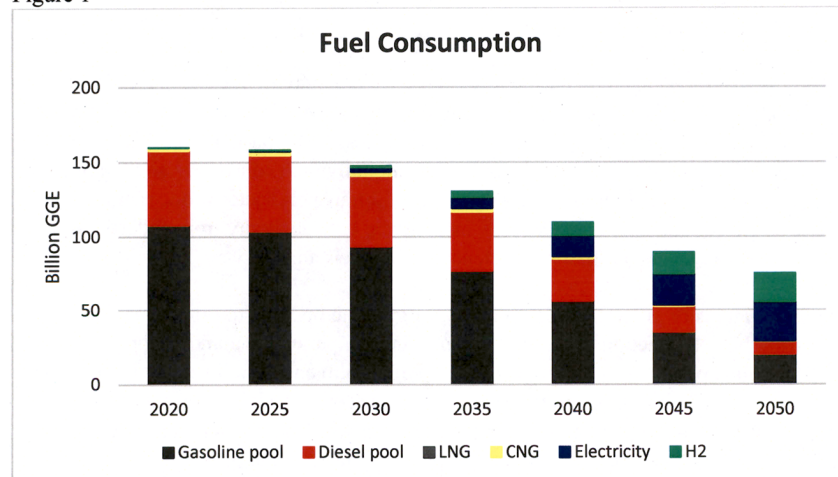
Continuing to maintain oil intensity in our transportation sector gives an opening to oil producing countries to interfere with the U.S. election process by undertaking temporary oil market supply cutbacks in hopes to boost U.S. gasoline prices to try to influence economic health and thereby election outcomes. Oil producers are similarly incentivized to try to raise oil prices to discourage U.S. environmental legislation by creating a false narrative that environmental regulation will lead to rising gasoline prices. Such misinformation confuses the issue because, of course, basic supply demand principles are clear: Less demand for gasoline will lead to lower prices, not “cause” higher prices. The less demand there is for oil and the more decoupled road fuel is from high dependence on oil, the more elastic the price of fuel will be; that is, consumers will have more power to shift among different diverse fuel sources. The more decoupled economic activity is from oil, the less monopoly power OPEC has in markets.

EVs are an effective tool to reduce OPEC market power and to decouple the U.S. economy from the ill-effects of oil price shocks. U.S. oil production is millions of barrels a day too low to meet U.S. domestic demand for road fuel. Even if U.S. oil production could recover to over 12.9 million b/d seen in November 2019, up from 11.6 million b/d currently, U.S. domestic oil supply would still fall short of covering current U.S. oil demand of roughly 20 million b/d. Adding electric vehicles to U.S. fleets would bring U.S. oil demand closer in balance with demand. The U.S. currently allows the exports of gasoline and diesel fuel. U.S. refined product exports average around 5 million b/d/.

EVs, by reducing U.S. domestic oil demand, would bring U.S. oil use and production into closer balance. Exported surpluses increase competition globally to lower world oil prices. As other countries also increase EV sales, the need for oil globally will also be reduced and the oil intensity of the global economy will fall, further adding further to energy security and reducing the market power and geopolitical influence of OPEC and Russia.

Recent calculations by UC Davis Institute for Transportation Studies (ITS-Davis) highlights the potential of electric vehicles to lower U.S. oil use. The study of low carbon transition for cars and trucks in the U.S., by Lew Fulton, Marshall Miller, and Qian Wang, estimates that EVs could reduce U.S. gasoline consumption from 103.7 billion gallons of gasoline equivalent (billion GGE) in 2025 to 56 billion GGE by 2040 or the equivalent of a reduction of one million barrels a day of oil equivalent. Diesel use could drop from 50.6 billion GGE to 29 billion GGE by 2040, or the equivalent of 460,000 barrels a day of oil equivalent. (See Figure 1 below).

Figure 1



Source: Energy Futures Program, UC Davis

**2. There is a global competition to build the vehicles of the future. How would incentives for domestic manufacturing of clean vehicles help the United States compete and how would that bolster our ability to protect our national interests?**

Leading in energy and vehicle innovation ensures that the U.S. military and space programs have a technological edge over geopolitical rivals and lowers the cost of addressing climate change. It has spurred new markets, industries and companies in the United States in recent years.

Without public funding and related political leadership to guide optimal outcomes, the United States could fall behind other nations that have well-developed, national initiatives such as China and Europe. A U.S. failure to address the challenge of the emerging race in manufacturing of smart and clean vehicles would be analogous to the United States opting to ignore the risks that the Soviet Union's superiority in space in 1957 might have threatened America's national security. Imagine today if the United States had inferior access to satellite and other kinds of sophisticated defense related aerospace technologies. That is, in effect, what it would mean if the United States does not address China's efforts to dominate the new digital energy and vehicles market with its own brand of smart drones, cyber surveillance technologies, and automated vehicles and electric networks that will not only underpin future economic trade in clean energy products, but also boost their relative capability in asymmetric warfare technology. The U.S. Pentagon has recognized this future and began funding research in automated machines and vehicles in 2004.

The U.S. Pentagon began funding an effort on the development of autonomous vehicles in 2002. Since then a new geostrategic race to dominate critical digital technologies for automation and electric mobility has begun in earnest. While most Americans think of such products as the latest in experimental commercial endeavors by Waymo to foster ride hailing services in self-driving cars in places like the suburbs of Arizona and efficient drone and electric AV delivery by Nuro or UberEats, major militaries are now competing in the spheres of autonomous vehicles and drones, tapping artificial intelligence, machine learning, and massive data analytics, to gain an edge in asymmetric warfare. The U.S. Congress set a goal that by 2015, "one third of the operational ground combat vehicles of the U.S. military be unmanned."<sup>1</sup> That deadline has come and gone but now the United States faces intense competition in this space from China.

China's industrial policy is aimed to deliver a range of technologies that will dominate the future global economy, including 5-G networks, solar panels, battery storage, electric and autonomous vehicles, drones, and commercial robotics, high performance computing/artificial intelligence applications, and high-speed rail. Many of these technologies are fundamental to superiority of weapons systems. Since Beijing first announced its Science and Technology initiative in 2006, it has launched the world's fastest supercomputer and become the world's largest drone manufacturer.

China's unparalleled size as the world's largest consumer country gives the country an economic and strategic advantage. The size of China's online shopping industry now totals over \$1 trillion. Its car market is also the world's largest. China produced 72 percent of the world's lithium-ion batteries in 2019, while U.S. manufacturing accounted for only 9 percent. China dominates the market for production of battery chemicals, cathodes, anodes, and battery cells.

China hopes to utilize its consumer spending power to attract innovative companies and to attain top status in critical strategic industries in clean energy. Innovative U.S. companies ranging from those that with technologies to 3D print cars to makers of advanced materials have shifted to China after failing to find public funding in the United States.

China has been particularly aggressive targeting smart, connected vehicles technology including self-driving cars and has engaged in espionage against U.S. companies to gain access to American technological knowhow. The dual use nature of the technology raises the stakes, as well as vulnerability to cyber-attack. U.S. Justice Department officials have focused on the problem of intellectual property theft, but it is not sufficient to close the door to Chinese intellectual property theft. What is needed is an affirmative strategy that paves a positive response to how the public sector can promote the superiority of America's technological edge and broader the participation of more American workers in the process. For its part, China is focused on winning the race to install 5-G networks in its major cities, in part so it can attract self-driving automotive industries that might be reluctant to miss out on the opportunity to pilot their wares more quickly at scale. The United States currently lags behind.

Domestic advanced vehicle manufacturing must be part and parcel of any effort that the United States makes to maintain its economic, military, and diplomatic

stature as a global world power. The global electric vehicle market, estimated at \$162 billion in 2019, and is projected to hit \$1 trillion by the late 2020s. It is hard to fathom how the American car industry can remain globally competitive without a large push to participate in this growing sector.

Recognizing the importance of advanced vehicles to future economic competitiveness and security, the European Union, worried about future dependence on China for its clean energy future, has committed to a \$1 trillion initiative to create an internationally competitive battery supply chain, including mining, recycling, and manufacturing to its own shores. France and Germany have announced a \$5 billion to \$6.7 billion consortium of automobile and energy firms to enhance Europe's electric car battery manufacturing capability. The European Union will be providing public subsidies. Even with the COVID-19 pandemic, European leaders are emphasizing European stimulus packages will support the planned shift to clean energy. The European Council reaffirmed that the roadmap for economic recovery will feature the green transition and digital transformation with a "central and priority role in relaunching and modernizing our economy."<sup>ii</sup>

The United States needs a concerted effort to ensure that its car industry remains internationally competitive and is producing the vehicles that will be demanded in global markets in the coming years. Given large interventions in domestic advanced automobile industries by governments of all other major economies, it behooves the United States to keep pace to avoid the risk of not only further job losses in the sector, but also a deterioration of its supremacy in manufacturing and utilizing advanced, automated vehicles for national defense purposes.

**3. Some of the climate investments in the Build Back Better Act could also help us meet our short-term energy needs, such as providing incentives to capture methane emissions from fossil oil and gas production. We're expecting high natural gas prices in many parts of the country this winter. Should Congress encourage oil and gas companies to stop methane leaks?**

Methane leaks are wasteful and environmentally damaging. It is critical that methane leakage into the atmosphere be ended to reduce U.S. greenhouse gas emissions, and specifically methane emissions, in line with targets set forth at the 2021 Glasgow climate meetings. In some cases, methane emissions result from poor maintenance of equipment. In other situations, routine flaring and venting stems from poor or sloppy corporate planning, where oil fields are brought online without consideration of proper coordination to an evacuation strategy for the associated gas (eg it is either just assumed it will be "ok" to flare or vent gases that have no transport access or market uptake despite rules to the contrary or companies fail to find an alternative solution when there is an unexpected delay in construction transport infrastructure).

Either way, it is inexcusable to literally burn natural gas into the sky as a routine operation, regardless of whose fault the transportation bottleneck is. The sky should not be used as a garbage dump for natural gas to allow private companies to make money producing associated oil. Companies are looking increasingly at other options for stranded natural gas production such as connecting it to impromptu data centers or transportation fuel applications to find outlets for gas that is lacking buyers.

Colorado has already implemented strict regulations on methane requiring oil and gas companies to find and fix methane leaks and to install technologies to limit or prevent emissions at existing operations. PHMSA and Department of Interior should follow suit. Companies operating in Colorado have had no difficulty complying with these stricter rules, which cover not only production wells but also tanks and performance standards for pipelines. Technologies including sensors, infrared cameras on drones, and satellite imagery are being used by industry to identify sources of leaks. The use of these technologies creates jobs and improves environmental practices.

Methane leakage from oil and gas operations is an important source of greenhouse gas emissions in the United States. Methane emissions from the energy sector is recorded at 267.6 million metric tons of CO<sub>2</sub> equivalent in 2019, according to EPA estimates. However, recent scientific studies indicate that this estimate is likely too low.<sup>iii</sup> Federally-mandated methane restrictions from the U.S. oil and gas sector could reduce the methane emissions equivalent to 920 million metric tons of CO<sub>2</sub> between now and 2035. Some of that methane (roughly 41 million tons annually) could be captured and sold to consumers, helping lower energy costs to households and businesses. Some of the largest U.S. natural gas companies, such as EQT and Apache, are already moving to end methane leakage, meaning their operations will already be compliant with any new federal restrictions. It is desirable for the rest

of the industry to take this path to preserve access to European and Asian liquefied natural gas markets where requirements for certification of low carbon intensity are becoming more prevalent.

**4. Do you agree that fossil fuel production companies should be responsible for preventing pollution from the production infrastructure they build? And should those same companies also be responsible for appropriately decommissioning energy infrastructure they build and remediating any environmental impacts?**

Taxpayers should never be saddled with the cost of appropriately decommissioning energy infrastructure and remediating environmental impacts instead of the companies that generated the profit from operating that infrastructure.

Stronger assurance regulations are needed to deal with an increasing burden of decommissioning liabilities. Congress should support Interior's proposed fitness to operate standard for evaluating potential lessees based on companies' environmental and safety records, as well as credit worthiness to sustain liabilities that might accrue following an accident like the one seen last year in Newport Beach, California, involving facilities of a highly leveraged, indebted private oil company. All companies should be required to underwrite adequate bonding for accidents and decommissioning as part of their licensing and permitting process. Increasing bond requirements will become increasingly imperative as the energy transition gains pace and more fossil fuel facilities reach retirement age. Bankruptcy should not be the mechanism oil and gas leaders and their investors use to bypass the business costs of winding down operations.

**5. Why might it make sense to increase royalty rates on oil and gas production within federal lands and waters?**

U.S. oil and gas development on federal lands is structured on concessionary terms where private investors carry the risk of exploration and the government is shielded from that risk, collecting instead fixed royalties and taxes. Under this system, the investor is left with all of the windfall if oil prices rise significantly, but equally all of the downside if prices collapse. Currently, U.S. royalty rates are 12.5% for onshore leases and 18.7% for offshore leases, depending on depth.

Consideration of the appropriate level of royalty rates is a function of a number of factors, including the competitive standing within the global market for fiscal terms for exploration and production opportunities. U.S. exploration companies consider the overall potential internal rate of return (IRR) that can be achieved in capital investment across a variety of geographies and locations. The size of potential resources, political and currency risk, and the competitiveness of overall fiscal terms influence an exploration company's decision to select one opportunity over another. Federal royalty rates are just one element that determines the attractiveness of a U.S.-based resource play to potential drillers.

To answer the question of whether it might make sense to increase royalty rates on oil and gas production within U.S. federal lands and waters, the goals to that increase must be considered. Trade-offs between competing 'intentionalities' need to be considered. An increase in royalty rates can be used to achieve the following aims:

- 1) To increase federal government revenue
- 2) To adjust U.S. fiscal terms in alignment with global levels
- 3) To ensure the federal government is better compensated during periods of high oil prices and plentiful windfalls
- 4) To discourage development of marginal acreage and incentivize capital investment only in the most prospective regions
- 5) To slow down oil and gas development by raising costs to investors

On a commercial basis (not considering other goals), the optimal level for royalties on U.S. federal lands should reflect a level (when combined with other taxes and charges) that is competitive with fiscal terms offered globally. Too high a royalty rate could prompt exploration companies to shift capital spending to other countries with more competitive terms for exploration. Too low a royalty rate compared to international locations means the U.S. federal government is "leaving money on the table" so to speak and has room to increase its take. It should be noted that royalties are just one element of exploration fiscal terms.<sup>iv</sup>

In assessing the benefit of changes in the level of royalties for oil and gas development on U.S. federal lands, it is important to consider the purpose of the change. If the federal government is considering a royalty increase to improve revenues from its leasing programs but wants to do so in a manner that promotes optimum devel-



opment of core producing areas, it should consider a sliding scale approach that varies the royalty rates based on resource potential and level of oil prices. A variable royalty rate that would increase in times of high oil prices would allow the federal government to garner more revenue in a manner that would have less negative impact on the level of investment. For example, a higher royalty rate could be borne easily in markets where oil prices surpass \$70 or \$80 a barrel than in markets where oil prices are averaging \$30 or \$40 a barrel. Some international fiscal regimes are structured around a sliding scale of royalties and taxes that are tied to changing level in oil prices. Generally speaking, higher royalty and tax rates for exploration and production could also serve to discourage investment in marginal, low prospective production regions.

#### REFERENCES PAGE

<sup>i</sup> Brown, Meta, "Driverless Cars, Analytics and Tough Standards for 21st Century Innovation," *Forbes*, August 29, 2015, <https://www.forbes.com/sites/metabrown/2015/08/29/driverless-cars-analytics-and-tough-standards-for-21st-century-innovation/#68cd340445a6>

<sup>ii</sup> A Roadmap For Recovery: Towards a more resilient, sustainable and fair Europe, <https://www.consilium.europa.eu/media/43384/roadmap-for-recovery-final-21-04-2020.pdf>

<sup>iii</sup> Jeffrey S. Rutherford et al, *Nature Communications*, August 2021 <https://www.nature.com/articles/s41467-021-25017-4>

<sup>iv</sup> <https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Energy-Economics/Fair-Market-Value/2018-GOM-International-Comparison.pdf>

[Whereupon, at 3:11 p.m., the committee was adjourned.]

